(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 896 079 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
23.04.2003 Bulletin 2003/17

(51) Int Cl.7: D04H 1/00, D04H 1/54, B29C 43/02

(21) Application number: 98114644.2

(22) Date of filing: 04.08.1998

(54) Method of and apparatus for shaping fibrous elastic body

Verfahren und Vorrichtung zum Formen eines elastischen Faserformkörpers

procédé et dispositif pour la mise en forme d' un corps élastique

(84) Designated Contracting States:
DE FR GB

(30) Priority: 05.08.1997 JP 21077797
21.01.1998 JP 974698

(43) Date of publication of application:
10.02.1999 Bulletin 1999/06

(73) Proprietors:
- ARACO KABUSHIKI KAISHA
Toyota-shi, Aichi-ken 473-8512 (JP)
- TEIJIN LIMITED
Osaka-shi Osaka 541-0054 (JP)

(72) Inventors:
- Mori, Takayasu, c/o Araco Kabushiki Kaisha
Toyota-shi, Aichi 473-8512 (JP)
- Nomura, Masafumi, c/o Araco Kabushiki Kaisha
Toyota-shi, Aichi 473-8512 (JP)
- Yamaguchi, Masanao, c/o Teijin Limited
Osaka-shi, Osaka 541-8587 (JP)

(74) Representative: VOSSIUS & PARTNER
Siebertstrasse 4
81675 München (DE)

(56) References cited:
GB-A- 2 140 837
US-A- 4 418 031
US-A- 5 494 627
US-A- 3 354 248
US-A- 4 648 934

Description

[0001] The present invention relates to a method of and an apparatus for shaping a fibrous elastic body which is, for example, used for a seat back pad, a seat cushion pad, or a pad, etc., of a seat for an automobile.

[0002] Molded polyurethane foam is in popular use, for example, as a material for a seat back pad, a seat cushion pad, etc., of a seat for an automobile. However, in recent years, a fibrous elastic body, due to its excellent recyclability, has attracted more attention than shaped polyurethane foam which is inferior in terms of recyclability. Such a fibrous elastic body is shaped by a laminate shaping technique or a blow shaping technique which will be described below.

[0003] First, the laminate shaping technique will be described. Before describing the technique, a technique for shaping a matted fiber material which is used for the laminate shaping technique will be described with reference to the explanatory diagrams in Fig. 15(a) through Fig. 15(e). In Fig. 15(a), a matrix fiber which is made of a polyester fiber and a binder fiber which is made of a polyester fiber which has a lower melting point than that of the matrix fiber are prepared. Next, in Fig. 15(b), the matrix fiber and the binder fiber are cotton-blended. Next, in Fig. 15(c), the cotton-blended fibers are fibrillated (or opened), thereby obtaining a fibrillated fiber material 100. Then, in Fig. 15(d), the fibrillated fiber material 100 is matted, thereby obtaining a matted fiber material 101 which has a certain thickness with a certain density. Next, in Fig. 15(e), the matted fiber material 101 is cut into a predetermined shape, whereby a cut fiber material (or "a fibrous mat material") 102 is obtained. On average, a number of cut-out pieces for a seat back pad is 6 to 8.

[0004] Now, a shaping die which is used for laminate type shaping will be described with reference to Fig. 14 (a) through Fig. 14(d) which shows the shaping process. A shaping die 130 includes a bottom die 131 and a top die 135 which are approximately box-like in shape. In Fig. 14(a), the top die 135 is omitted. The bottom die 131 and the top die 135 have shaping surfaces 131a and 135a, respectively, which define a predetermined shape, i.e., a cavity of a seat back pad when the shaping die is closed. The respective shaping surfaces 131a and 135a of the bottom die 131 and the top die 135 are formed by a highly breathable punching metal which includes a number of holes. The shaping surface 131a of the bottom die 131 forms a front surface portion of the seat back pad. The shaping surface 135a of the top die 135 forms a back surface portion of the seat back pad. An air supply slot 133 is formed at the bottom surface of the bottom die 131. On the other hand, an exhaust slot 136 is formed at the top surface of the top die 135.

[0005] To shape a seat back pad using the shaping die 130 described above by the laminate-type method, in Fig. 14(a), the fibrous mat material 102 described earlier is disposed as a laminate, within the shaping surface 131a of the bottom die 131 which is opened. Next, in Fig. 14(b), the top die 135 is closed over the bottom die 131 to thereby clamp the fibrous mat material 102. In this condition, heated air is force-fed inside the bottom die 131 through the air supply slot 133 of the bottom die 131. After being blown through the fibrous mat material 102, the heated air is discharged outside through the top die 135 at the exhaust slot 136. Heating with the heated air melts the binder fiber which is contained in the fibrous mat material 102, whereby the matrix fiber is shaped into the shape of a seat back pad. Following this, in Fig. 14(c), instead of the heated air, cool air is blown through the fibrous mat material 102 to thereby cool the fibrous mat material 102. This solidifies the melted binder fiber. Next, in Fig. 14(d), the shaping die is opened and the content is removed from the shaping die, whereby a seat back pad 110 is obtained.

[0006] Now, the blow shaping technique will be described with reference to the explanatory diagram in Fig. 16. A shaping die 140 which is used in this type of shaping is almost the same as the shaping die which is used in the laminate shaping technique described above, and therefore, identical reference symbols will be assigned to identical or corresponding portions. A redundant description will be omitted, and different portions will be described. The bottom die 131 and the top die 135, as they are opened, are enclosed by a restriction box 141 which is formed by a punching metal. The bottom die 131 includes a material blowing slot 132 which leads to an inner space which is created between the bottom die 131 and the top die 135 as they are opened. Unlike the laminate-type method, the blow-type method uses the fibrillated fiber material 100 which is obtained during the course of shaping of the fibrous mat material 102 (See Fig. 15(c)), instead of using the fibrous mat material 102.

[0007] To shape a seat back pad using the shaping die 140 as described above by the blow-type method, in Fig. 16, the inner space between the bottom die 131 and the top die 135 is filled with the fibrillated fiber material 100 by means of air feeding under a pressure feed force, that is, air blown, through the material blowing slot 132 of the bottom die 131. Following this, the fibrillated fiber material 100 is clamped, with the top die 135 fit with the bottom die 131. Next, through steps which are similar to the shaping process of the laminate-type method (See Fig. 14(b) through Fig. 14(d)), the seat back pad 110 is obtained.

[0008] The laminate shaping technique described above, requiring to set the fibrous mat material 102 inside the shaping die 130 depending on necessity, ensures an advantage that it is possible to shape a material which has a complex shape including a vertical wall portion, a pocketform portion, etc., without creating any significant defective shape due to density shortage or filling shortage. Another advantage is that it is possible to set a non-woven fabric, a pendant wire and the like, which are to be attached to the back surface of the seat cushion pad 110, in the shaping die 130 together with the

fibrous mat material 102 and to simultaneously shape them.

[0009] However, in the laminate shaping technique, in order to suppress a density change at a joint portion where the fibrous mat material 102 is disposed overlapping, about 6 to 8 cut-out pieces are necessary as described earlier. Hence, it is necessary to cut the matted fiber material 101 and consequently form about 6 to 8 pieces of the fibrous mat material 102, and set the cut fibrous mat materials 102 one after another to the bottom die 131. This creates a problem where productivity is very bad.

[0010] Meanwhile, according to the blow shaping technique, since it is not necessary to cut the matted fiber material 101 and set the fibrous mat materials 102 to the bottom die 131, which is required in the laminate shaping technique, the problem of bad productivity is solved. In addition, since the blow shaping technique rarely creates a defective shape due to density shortage and filling shortage if an article to be shaped has a simple shape such as a cubic shape and a rectangular shape, the blow shaping technique is appropriate. However, when an article to be shaped has a complex shape which includes a vertical wall portion, a pocketform portion, etc., the blow shaping technique creates defective shape problem due to density shortage or filling shortage, as will be described in detail below.

[0011] Density shortage will be described with reference to the explanatory diagrams in Fig. 17(a) and Fig. 17(b). In Fig. 17(a), a fiber density of the fibrillated fiber material which is filled by blowing into the inner space which is created between the bottom die 131 and the top die 135 as they are opened is approximately constant.

[0012] At this stage, it is assumed that a thickness B1 of a general portion of the seat back pad is 3, a thickness A1 of vertical wall portions on the left-hand and the right-hand sides (i.e., portions which include a side support portion and an edge portion of the seat back pad) is 5, and fiber densities of the respective portions are both 1. Assuming that a clamping volume C at clamping of the fiber material with shaping die closed is 2, the thickness A of the vertical wall portions is:

$$A = (A1 - C) / A1 = 3/5$$

The fiber density accordingly changes to 5/3. Meanwhile, the thickness B of the general portion is:

$$B = (B1 - C) / B1 = 1/3$$

The fiber density accordingly changes to 3. Therefore, the fiber density D1 of the vertical wall portions is as low as 5/9 of the fiber density D2 of the general portion, thereby creating a defective shape due to density shortage. Because of this, with the blow shaping technique, it is difficult to increase the rigidity of the side support portion which demands a higher rigidity, due to a necessity related to side supportability or the like, than in the case of the general portion.

[0013] Next, filling shortage is described with reference to the explanatory diagrams in Figs. 18(a), 18(b) and 18(c). Among the diagrams, Fig. 18(a) is a cross sectional view showing a condition in which the fibrillated fiber material 100 is filled in the shaping die 140, Fig. 18(b) is a cross sectional view showing a condition of the shaping die 140 of Fig. 18(a) as it is closed, and Fig. 18(c) is a cross sectional view showing another example of the shaping die 140. As in the case of the shaping die 140 as that shown in Fig. 18(b) which includes an under portion 134 where the bottom die 131 is in an undercut state with respect to a parting line PL, as shown in Fig. 18(a), since the fibrillated fiber material 100 to be filled in by blowing does not easily reach the under portion 134 of the bottom die 131, filling shortage of the fiber material 100 results. It then follows that even when the die is closed and the fibrillated fiber material 100 is clamped, as shown in Fig. 18(b), it is not possible to avoid a decrease in the density in the under portion 134 of the bottom die 131, which in turn creates a defective shape. Meanwhile, when the parting line PL is set at a position which corresponds to an outer most position of the seat back pad and the under portion 134 is accordingly excluded as shown in Fig. 18(c), a trace of the parting line PL easily appears in a design surface of the seat back pad product. This creates a necessity to post-process the trace, which is an increase in cost and not desirable.

[0014] Another example of filling shortage will be described with reference to the explanatory diagrams in Figs. 19(a) and 19(b). Among the diagrams, Fig. 19(a) is a cross sectional view showing a condition in which the fiber material 100 is filled in the shaping die 140, while Fig. 19(b) is a cross sectional view showing a condition of the shaping die 140 of Fig. 19(a) as it is closed. In Fig. 19(a), when the top shape 135 includes a recess portion 137 which corresponds to a pocketform back lining top portion (or "a pocketform portion") which is formed above the seat back pad, the fibrillated fiber material 100 which is filled in by blowing through the material blowing slot 132 of the bottom die 131 does not easily enter the recess portion 137, which in turn results in filling shortage of the fiber material 100. Therefore, it is not possible to avoid a decrease in the density within the recess portion 137 even though the die is closed and the fibrillated fiber material 100 is clamped, thereby creating a defective shape.

[0015] Accordingly, an object of the present invention is to provide an improved method of and an improved apparatus for shaping a fibrous elastic body. This object is achieved by the claims.

[0016] The invention provides the advantage to form an objective shaped article with excellent productivity while avoiding a defective shape due to density short-

age, filling shortage or the like.

[0017] An embodiment of the present invention is directed to a method of and an apparatus for shaping a fibrous elastic body.

[0018] The method according to the present invention first requires to fill a fiber material into a preliminary shaping die to shape a preliminary shaped item which has a preliminary shape of an objective article to be shaped. The fiber material contains a binder fiber which thermally melts.

[0019] The apparatus according to the present invention comprises a preliminary shaping die for shaping such a preliminary shaped item.

[0020] The method according to the present invention requires to fill the preliminary shaped item into a final shaping die, heat up and clamp the preliminary shaped item, to thereby shape the objective article. As a result, a fibrous elastic body is shaped as a final product. As herein termed, the binder fiber is a fiber which melts at a predetermined temperature when heated. The melted binder fiber has a function of infiltrating a fiber material and fixing the shape of a shaped item.

[0021] The apparatus according to the present invention comprises a final shaping die for shaping such a final product.

[0022] According to a preferred embodiment of the present invention, during shaping of the preliminary shaped item, the preliminary shape of the preliminary shaped item is a shape which corresponds to the objective article as it is developed. That is, a developed shape of the objective article is shaped preliminarily, and the developed shape is shaped into the objective article using the final shaping die.

[0023] According to another preferred embodiment of the present invention, during shaping of the preliminary shaped item, the binder fiber is half melted.

[0024] As herein termed, the half melted condition is a condition where the binder fiber does not melt completely, but a portion of the binder fiber such as an outer surface melts while the other portion remains solid.

[0025] According to still another preferred embodiment of the present invention, during filling of the preliminary shaped item into the final shaping die, parts such as a backing strip, a front layer pad and an insert wire are filled in together with the preliminary shaped item. This allows to simultaneously shape the parts and the preliminary shaped item during final shaping, thereby the objective article is obtained.

[0026] According to the present invention, first, a necessary quantity of the fiber material which is needed for shaping of the objective article is filled into the preliminary shaping die, and the preliminary shaped item is accordingly shaped considering a rational proportion of the fiber material, and therefore, filling shortage does not occur during shaping of the objective article using the final shaping die. As a result, the objective article is shaped with excellent productivity while avoiding a defective shape due to density shortage, filling shortage, etc.

[0027] The present invention will be understood better from the following description on the preferred embodiments of the present invention when taken in conjunction with the drawings or the claims.

Figs. 1(a) through 1(f) are explanatory diagrams showing a first preferred embodiment;

Figs. 2(a) through 2(d) are explanatory diagrams of a seat back pad;

Figs. 3(a) through 3(d) are explanatory diagrams showing a preliminary shaped item;

Figs. 4(a) and 4(b) are explanatory diagrams showing a preliminary shaping die;

Fig. 5 is a plan view of a bottom die of the preliminary shaping die;

Figs. 6(a) and 6(b) are explanatory diagrams showing the preliminary shaping die as it is clamped;

Figs. 7(a) and 7(b) are explanatory diagrams showing a final shaping die;

Figs. 8(a) and 8(b) are explanatory diagrams showing the final shaping die as it is being clamped;

Figs. 9(a) and 9(b) are explanatory diagrams showing the final shaping die as it is being clamped under heat;

Figs. 10(a) through 10(f) are explanatory diagrams showing a second preferred embodiment;

Figs. 11(a) through 11(d) are explanatory diagrams showing a preliminary shaped item;

Figs. 12(a) through 12(d) are explanatory diagrams showing a preliminary shaping process;

Fig. 13 is an explanatory diagram showing a condition in which the preliminary shaped item is filled into the final shaping die;

Figs. 14(a) through 14(d) are explanatory diagrams showing shaping processes in a conventional laminate-type method;

Figs. 15(a) through 15(e) are explanatory diagrams showing conventional shaping processes of shaping matted fiber material;

Fig. 16 is an explanatory diagram showing a filling process in a conventional blow-type method;

Figs. 17(a) and 17(b) are explanatory diagrams for describing density shortage;

Figs. 18(a) through 18(c) are explanatory diagrams for describing filling shortage;

Figs. 19(a) and 19(b) are explanatory diagrams for describing another example of filling shortage;

Figs. 20(a) and 20(b) are explanatory diagrams showing a condition in which the preliminary shaped item and parts are filled into the final shaping die; and

Figs. 21(a) through 21(c) are explanatory diagrams showing another example of the preliminary shaping process.

<First Preferred Embodiment of the Present Invention>

[0028] A description will be given on a method of and an apparatus for shaping a fibrous elastic body according to a first preferred embodiment of the present invention, with reference to Fig. 1(a) through Fig. 9(b). First, a seat back pad of an automobile which is an objective article to be shaped in the first preferred embodiment will be described with references to the explanatory diagrams in Fig. 2(a) through Fig. 2(d). Fig. 2(a) is a perspective drawing as viewed from the front, Fig. 2(b) is a perspective drawing as viewed from the back, Fig. 2(c) is a side sectional view, and Fig. 2(d) is a plan sectional view. A seat back pad 1 is formed by a fibrous elastic body, for example, a polyester fibrous elastic body, and comprises on the surface thereof a general portion 2 which forms a backrest surface 2a, vertical wall portions 3 (or "side portions") which are formed on the left-hand side and the right-hand side of the general portion 2, and a pocketform back lining top portion (or "a pocket-form portion") 4 which is formed above the general portion 2. Each vertical wall portion 3 includes a side support portion 3a and an edge portion 3b.

[0029] A technique of shaping the seat back pad 1, as a preprocessing step prior to a final shaping process of shaping the seat back pad 1, includes a preliminary shaping process of shaping a preliminary shaped item 10 which is shown in Fig. 3(a) through Fig. 3(d). Fig. 3 (a) is a perspective drawing as viewed from the front, Fig. 3(b) is a perspective drawing as viewed from the back, Fig. 3(c) is a side sectional view, and Fig. 3(d) is a plan sectional view. The preliminary shaped item 10 has a general shape which is simplified based on a developed shape of the seat back pad 1 which is shown in Fig. 2(a). That is, the preliminary shaped item 10 comprises a main portion 12 which will become the general portion 2 of the seat back pad 1 which is shown in Fig. 2(a), developed side portions 13 of the left-hand side and the right-hand side which correspond to the vertical wall portions 3 as they are developed to the left-hand side and the right-hand side of the main portion 12, and a developed top portion 14 which corresponds to the back lining top portion 4 as it is developed above the main portion 12, and has an approximately flat-panel shape which is thicker than the general portion 2. The respective developed side portions 13 are formed to have a developed length which is approximately double those of the corresponding vertical wall portions 3, respectively, in the left-hand direction and the right-hand direction.

[0030] First, the preliminary shaping process of shaping the preliminary shaped item 10 will be described. As in the conventional blow-type technique described earlier, the fibrillated fiber material 100 is a fiber material which is to be used at this process. The fibrillated fiber material 100 is a fiber material of a heat fusion type which uses a matrix fiber, which is formed by a polyester fiber of 1.8 to 27 dtex(2 to 30 denier) and serves as a main frame, and a binder fiber, which is formed by a polyester fiber of 1.8 to 9 dtex(2 to 10 denier) which has a low melting point and bonds the matrix fiber, at a mixing ratio of 10 to 50 %, for example. As the matrix fiber, a crimped fiber is used so that the matrix fiber has an elasticity. As the fibrillated fiber material 100, ELK (brand name) which is available from Teijin Ltd., for example, may be used.

[0031] Now, a preliminary shaping die 20 which is used for preliminary shaping will be described with reference to the front sectional view in Fig. 4(a) and the side sectional view in Fig. 4(b). The preliminary shaping die 20 which is illustrated as it is opened in Figs. 4(a) and 4(b) comprises a bottom die 21 and a top die 25 which are approximately box-like shaped. The bottom die 21 and the top die 25 have shaping surfaces 21a and 25a, respectively, which define a cavity of the preliminary shaped item 10 when the shaping die is closed. The respective shaping surfaces 21a and 25a of the bottom die 21 and the top die 25 are formed by a highly breathable punching metal which includes a number of holes at a proportion of approximately 2 to 40 %, for instance. The shaping surface 21a of the bottom die 21 forms a front surface portion of the preliminary shaped item 10. The shaping surface 25a of the top die 25 forms a back surface portion of the preliminary shaped item 10. A material blowing slot 22 is formed at one side of the surface of the bottom die 21, and an air supply slot 23 is formed at the bottom surface of the bottom die 21. On the other hand, an exhaust slot 26 is formed at the top surface of the top die 25. Further, in Fig. 5 which shows the plan view of the bottom die 21, the shaping surface 21a of the bottom die 21 includes a main portion forming portion 21A which forms the main portion 12 of the preliminary shaped item 10, side portion forming portions 21B which form the developed side portions 13 of the left-hand side and the right-hand side, and a top portion forming portion 21C which forms the developed top portion 14.

[0032] In order to shape the preliminary shaped item 10 using the preliminary shaping die 20 described above, in Figs. 4(a) and 4(b), an inner space which is created between the bottom die 21 and the top die 25 as they are opened is filled with the fibrillated fiber material 100 by air feeding under a pressure feed force, that is, air blown, through the material blowing slot 22 of the bottom die 21. At this stage, since the preliminary shaped item 10 has a simple shape which is close to a rectangular parallelepiped, filling is performed at a constant density distribution while avoiding density shortage or filling shortage which is otherwise caused during filling of the fibrillated fiber material 100 into the preliminary shaping die 20. A density (bulkiness density) at which the fibrillated fiber material 100 is filled into the preliminary shaping die 20 is preferably about 0.005 to 0.02 g/cm^3, for example. Further, instead of air feeding under a pressure feed force described above, filling may be realized by means of air feeding with a suction force

which sucks in the air within the cavity, that is, suction of air utilizing the air supply slot 23 of the bottom die 21 and the exhaust slot 26 of the top die 25.

[0033] Next, as shown in the front sectional view in Fig. 6(a) and the side sectional view in Fig. 6(b), the top die 25 is closed over the bottom die 21 to clamp the fiber material 100. Clamping of the top die 25 is continued until the density of the fiber material 100 becomes about 0.02 g/cm^3, for example. Following this, in the clamping condition described immediately above, heated air is fed inside the bottom die 21 under pressure through the air supply slot 23 of the bottom die 21. After being blown through the fiber material 100, the heated air is discharged outside at the exhaust slot 26 through the top die 25. The heated air is set to a mild temperature which half melts the binder fiber of the fiber material 100, e.g., 180°C which is 15 to 20°C lower than the melting temperature of 200°C, for example, of the melting temperature of the binder fiber. Heated by the heated air, the binder fiber which is contained in the fiber material 100 half melts, whereby the matrix fiber is preliminarily shaped in the shape of the preliminary shaped item. As herein termed, half melting refers to a condition where a portion of the binder fiber, such as an outer surface, melts but the binder fiber otherwise remains solid instead of completely melting.

[0034] Instead of the heated air, vapor may be used as a heat medium.

[0035] Next, instead of the heated air, cool air is blown through the fiber material 100 which now has the shape of the preliminary shaped item, to thereby cool the fiber material 100 to about 100°C, for example. This solidifies the half melting binder fiber. Following this, the shaping die is opened and the content is detached from the shaping die, whereby the preliminary shaped item 10 as that shown in Figs. 3(a) through 3(d) is obtained. During die opening, as shown in Figs. 6(a) and 6(b), by means of a suction air force which is provided through the exhaust slot 26 of the top die 25, the preliminary shaped item 10 is sucked to the shaping surface 25a of the top die 25 and the shaping die is opened. Both the top die 25 and the preliminary shaped item 10 are conveyed to the next step which is the final shaping step, which realizes easy handling of the preliminary shaped item 10.

[0036] Now, the final shaping step will be described. With reference to the front sectional view in Fig. 7(a) and the side sectional view in Fig. 7(b), a final shaping die 30 which is used for final shaping will be described. The final shaping die 30, which is shown as it is opened in both Fig. 7(a) and Fig. 7(b), comprises a bottom die 31, a first top die 35 and a second top die 37 which are approximately box-like shaped. The bottom die 31, the first top die 35 and the second top die 37 include a shaping surface 31a, a shaping surface 35a and a shaping surface 37a, respectively, which form the cavity of the seat back pad 1 which is to be shaped with the die closed. The shaping surface 31a, the shaping surface 35a and the shaping surface 37a, respectively, of the bottom die 31, the first top die 35 and the second top die 37, like the shaping surfaces of the preliminary shaping die 20 described earlier, are formed by a highly breathable punching metal which includes a number of holes. The shaping surface 31a of the bottom die 31 forms a front surface portion of the seat back pad 1. The shaping surface 35a of the first top die 35 forms a back surface portion of the seat back pad 1. The shaping surface 37a of the second top die 37 forms a front surface portion of the back lining top portion 4 of the seat back pad 1. The bottom die 31 includes an air supply slot 32 in the bottom surface thereof. Meanwhile, an exhaust slot 36 and an exhaust slot 38 are formed in the top surfaces of the first top die 35 and the second top die 37, respectively.

[0037] In order to shape the seat back pad 1 using the final shaping die 30, in Figs. 7(a) and 7(b), the preliminary shaped item 10 which is shaped at the preliminary shaping step (See Figs. 3(a) through 3(d)) is filled into the shaping surface 31a of the bottom die 31 which is opened. Filling of the preliminary shaped item 10 may be performed by an operator, a robot hand, etc. At this stage, the developed top portion 14 of the preliminary shaped item 10, as shown in Fig. 7(a), is bent approximately in the shape of the letter L within the shaping surface 31a of the bottom die 31. Meanwhile, the developed side portions 13 of the left-hand side and the right-hand side of the preliminary shaped item 10, as shown in Fig. 7(b), are bent back within the shaping surface 31a of the bottom die 31 and then filled.

[0038] Next, as shown in the front sectional view in Fig. 8(a) and the side sectional view in Fig. 8(b), the first top die 35 is closed over the bottom die 31 to clamp the preliminary shaped item 10. Clamping of the first top die 35 is continued until the density of the fiber material 100 becomes about 0.02 to 0.03 g/cm^3, for example. The developed top portion 14 of the preliminary shaped item 10 is bent back over the corresponding portion of the first top die 35.

[0039] Next, as shown in the front sectional view in Fig. 9(a) and the side sectional view in Fig. 9(b), the second top die 37 is closed over the bottom die 31 to clamp the developed top portion 14 of the preliminary shaped item 10 in the first top die 35, while at the same time clamping the developed top portion 14 one stage further by the first top die 35. Clamping with the first top die 35 is continued until the density of the fiber material 100 becomes about 0.03 to 0.05 g/cm^3, for example. Clamping with the second top die 37 is continued until the density of the fiber material 100 becomes about 0.03 to 0.05 g/cm^3, for example.

[0040] Following this, in the clamping condition described immediately above, heated air is fed inside the bottom die 31 under pressure through the air supply slot 32 of the bottom die 31. After being blown through the preliminary shaped item 10, the heated air is discharged outside through the first top die 35 and the second top die 37 at the exhaust slots 36 and 38. The heated air is at such a strong temperature that it sufficiently melts the

binder fiber of the preliminary shaped item 10 but does not damage the matrix fiber, for instance, a temperature which is somewhat higher, e.g., higher by 20 to 30°C than the melting point of the binder fiber. For example, if the melting point of the binder fiber of polyester is 175°C, the temperature of the heated air is approximately 200°C. Heated by the heated air, the binder fiber which is contained in the preliminary shaped item 10 melts and soaks within the preliminary shaped item 10. Instead of heated air, vapor may be used as a heat medium.

[0041] Next, instead of heated air, cool air is blown through the preliminary shaped item 10 which now has the shape of the seat back pad, to thereby cool the preliminary shaped item 10 to about 80°C, for example. This solidifies the melted binder fiber. As a result, the seat back shape is fixed and a final product is obtained. After this, the shaping die is opened and the content is detached from the shaping die, whereby the seat back pad 1 as that shown in Fig. 2(a) is obtained.

[0042] Schematic views showing the shaping steps described above are shown in Figs. 1(a) through 1(f). More specifically. Figs. 1(a) through 1(c) show the preliminary shaping step, among which Fig. 1(a) shows the step of filling the fiber material 100, Fig. 1(b) shows the step of heat-clamping and cooling of the fiber material 100, and Fig. 1(c) shows the preliminary shaped item 10 as it is after being detached from the shaping die. On the other hand, Figs. 1(d) through 1(f) show the final shaping step, among which Fig. 1(d) shows the step of filling the preliminary shaped item 10, Fig. 1(e) shows the step of heat-clamping and cooling of the preliminary shaped item 10, and Fig. 1(f) shows the seat back pad 1 as it is after being detached from the shaping die.

[0043] According to the technique of shaping the seat back pad 1 which is formed by a fibrous elastic body described above, it is possible to fill the fibrillated fiber material 100 into the preliminary shaping die 20, with a rational material proportion and in a condition which easily allows filling a necessary quantity of the fibrillated fiber material 100 needed for the shaping of the seat back pad 1 which is an objective article to be shaped, and to preliminarily shape the fibrillated fiber material 100. This easily permits filling of the preliminary shaped item 10 into the final shaping die 30 without any filling shortage and finally shape. Hence, it is possible to shape the seat back pad 1 with excellent productivity while avoiding a defective shape due to density shortage, filling shortage, etc.

[0044] Describing in detail, the shaping technique, according to the first preferred embodiment, does not require to cut the fiber material or set the fibrous mat material to the bottom die which has been heretofore needed in the conventional laminate shaping technique, and therefore, it is possible to improve the problem of productivity. Further, it is possible to avoid a defective shape due to a drop in the density which is caused by a difference in the clamping volume for clamping the fibrillated fiber material and a defective shape due to an insufficient density in the pocketform portion 4. For example, while 0.030 g/cm^3 is a limit density of the vertical wall portions 3 when the density of the general portion 2 is 0.040 g/cm^3 according to the conventional technique (See Figs. 16 through 17(b)), according to the first preferred embodiment, it is possible to form the vertical wall portions 3 which have a density of 0.02 to 0.08 g/cm^3, and accordingly, to avoid a defective shape due to a drop in the density. In addition, since a restriction in terms of the structure of the shaping die (See Figs. 8(a) through 8(c)), such as the parting line PL, which has been heretofore a problem is lifted, even if the bottom die 31 is in an undercut state with respect to the parting line PL, a defective shape due to a drop in the density or other cause is avoided, and therefore, it is possible to set the parting line PL freely in any portion. Further, it is possible to solve the problem of filling shortage of the fiber material (See Figs. 19(a) and 19(b)) as compared with the recess portion of the shaping die which corresponds to the pocketform portion 4 of the seat back pad 1, and to avoid a defective shape due to an insufficient density of the pocketform portion 4.

[0045] In addition, since the fiber material is the fibrillated fiber material 100, it is possible to fill the fibrillated fiber material 100 easily into the preliminary shaping die 20 by air feeding with a suction force or a pressure feed force. This realizes a production efficiency, which is a problem to be solved in the conventional laminate shaping technique, as high as that in the blow shaping technique. For example, if a process expense rate is 1 in the laminate shaping technique, a process expense rate in the blow shaping technique is 0.5, whereas a process expense rate is 0.6 according to the first preferred embodiment. Further, instead of the fibrillated fiber material 100, a matted fiber material which has a low bulkiness density may be used.

[0046] Further, as the binder fiber is half melted and preliminarily shaped during the preliminary shaping, it is possible to enhance the shape retainability of the preliminary shaped item 10, and hence, to prevent the preliminary shaped item 10 from losing its shape while transported. Where pressure clamping alone does not cause the preliminary shaped item 10 to lose its shape, half melting of the preliminary shaped item 10 may be omitted. As herein termed, preliminary shaping refers to slight shaping, i.e., handling to such an extent which does not cause shape loss.

[0047] Further, since the preliminary shaped item 10 has a simple shape which is simplified based on the developed shape of the seat back pad 1, it is possible to simplify the shape of the preliminary shaped item 10 into an approximately flat plate-like shape.

[0048] Further, as the preliminary shaped item 10 as it is partially folded is filled into the final shaping die 30 so that the preliminary shaped item 10 is made partially dense, it is possible to easily create a high-density portion of the seat back pad 1 during final shaping.

[0049] Further, it is possible to fill parts, such as a non-woven fabric and a pendant wire, which are to be attached to the back surface of the seat back pad 1 into the final shaping die 30 together with the preliminary shaped item 10 and to simultaneously shape them altogether, as in the conventional laminate-type technique. Now, a method of such shaping will be described with reference to Figs. 20(a) and 20(b). Figs. 20(a) and 20 (b) are explanatory diagrams showing an example of a condition of filling for simultaneous shaping of parts, among which Fig. 20(a) is a side sectional view of the top die 35 of the final shaping die 30 as it is opened, and Fig. 20(b) is a similar side sectional view of the bottom die 31. First, after setting a preplaced pad 63, which will become a front layer of the pad material, within the bottom die 31, the preliminary shaped item 10 is set on the preplaced pad 63. Following this, a pendant wire 62 is set to a predetermined position of the back surface of the preliminary shaped item 10. Further, if necessary, a non-woven fabric 61 which is to be attached to the back surface of the preliminary shaped item 10 is set. The shaping die is thereafter closed and final shaping is executed, whereby the parts are shaped at once. The non-woven fabric 61 corresponds to what is referred to as the backing strip in the present invention, the pendant wire 62 corresponds to what is referred to as the insert wire in the present invention, and the preplaced pad 63 corresponds to what is referred to as the front layer pad in the present invention.

[0050] As described above, as the parts such as the non-woven fabric 61 and the pendant wire 62 are simultaneously shaped and integrated with each other into one unit, the adhesive power of the binder fiber which is contained in the fiber material integrates the parts with the seat back pad 1 accurately and efficiently.

[0051] Further, where simultaneous shaping of the parts as described above fails to provide a sufficient adhesion strength between the seat back pad 1 and the parts, when the preliminary shaped item 10 is set in the bottom die 31, a thin layer web which contains components such as the binder fiber is inserted between the preliminary shaped item 10 and the parts. As final shaping is executed in this condition, the web melts and adheres thereby exhibiting its adhesive power, and therefore, the adhesion strength between the preliminary shaped item 10 and the parts is largely increased. The thin layer web corresponds to the bonding means in the present invention. Alternatively, instead of the thin layer web, the bonding means may be an adhesive agent of the hot-melt type which is to be applied between the preliminary shaped item 10 and the parts, or an ordinary liquid or a jelly-like adhesive agent which is to be inserted between the preliminary shaped item 10 and the parts, thereby creating a similar effect to the above.

[0052] Further, it is possible to shape approximately to the final objective shape except for a local shape during preliminary shaping and to shape the local shape of the preliminary shaped item 10 which is preliminarily shaped locally into the final objective shape during final shaping. Now, such a shaping technique will be described with reference to Figs. 21(a) through 21(c). Figs. 21(a) through 21(c) are explanatory diagrams showing another example of a condition of filling for simultaneous shaping of parts, among which Fig. 21(a) is a side sectional view of the preliminary shaping die as it is opened, Fig. 21(b) is a side sectional view of the preliminary shaping die as it is closed, and Fig. 21(c) is a cross sectional view of the preliminary shaped item 10. As shown in Fig. 21(a), the top die 25 and the bottom die 21 of the preliminary shaping die 20 are used to create a cavity which is similar to the final objective shape, the fiber material 100 is filled by blowing into the inner space between the top die 25 and the bottom die 21. Next, as shown in Fig. 21(b), the top die 25 is moved downward after the fiber material 100 is filled, and the fiber material 100 is clamped. In this condition, heated air is blown through the preliminary shaped item 10 to thereby melt the binder fiber of the fiber material 100. Following this, after cooling and accordingly solidifying the binder fiber, the shaping die is opened and the content is detached from the shaping die, thereby obtaining the preliminary shaped item 10 as that shown in Fig. 21(c). As a result, the complex design surface and the back surface of the seat back pad 1 are shaped during preliminary shaping. Since it is necessary during final shaping to bend the left-hand side and the right-hand side frame portions of the preliminary shaped item 10 (i.e., the left-hand side and the right-hand side end portions of Fig. 21(c)), bent portions 10a are shaped larger than the final objective shape, leaving widths for compression. During final shaping, the frame portions of the preliminary shaped item 10 are shaped partially into the final objective shape.

[0053] As described above, as shaping approximately into the final objective shape is completed except for local shapes during preliminary shaping and the local shapes of the preliminary shaped item 10 which are preliminarily shaped are shaped partially into the final objective shape during final shaping, it is possible to set the preliminary shaped item 10 into the final shaping die easily and accurately during final shaping. Further, it is possible to suppress shaping using the final shaping die to a partial range. Hence, it is not necessary to heat up the entire final shaping die.

<Second Preferred Embodiment of the Present Invention>

[0054] A description will be given on a method of and an apparatus for shaping a fibrous elastic body according to a second preferred embodiment of the present invention, with reference to Fig. 10(a) through Fig. 13. The second preferred embodiment comprises a preliminary shaping step of shaping a preliminary shaped item 40 as that shown in Figs. 11(a) through 11(d) using a preliminary shaping die 50 as that shown in Fig. 12 as

a top die of a preliminary shaping die, as a step prior to the final shaping step of shaping the seat back pad 1. Fig. 11(a) is a perspective view as viewed from the front, Fig. 11(b) is a perspective view as viewed from the back, Fig. 11(c) is a side sectional view, and Fig. 11(d) is a plan sectional view. The preliminary shaped item 40 comprises a main portion 42 which will become the general portion 2 of the seat back pad 1, side portions 43 on the left-hand side and the right-hand side to the main portion 42, and a developed top portion 44 which corresponds to the pocketform portion 4 as it is developed above the main portion 42, and has an approximately flat-panel shape which is thicker than the general portion 2. The left-hand and the right-hand side portions 43 of the preliminary shaped item 40, different from the preliminary shaped item 10 according to the first preferred embodiment of the present invention (See Figs. 3(a) through 3(d)), are locally clamped with a larger clamping volume than that upon the general portion 2 and the back lining top portion 4, and thereby locally made dense.

[0055] Now, the preliminary shaping die 50 which is used for preliminary shaping according to the second preferred embodiment will be described with reference to the side sectional view in Fig. 12(a) which shows a condition with the shaping die open and the side sectional view in Fig. 12(b) which shows a condition with the shaping die closed. In Fig. 12(a), the preliminary shaping die 50 comprises a bottom die 51 which is approximately box-like shaped, a central top die 55, and divided top dies 57 of the left-hand side and the right-hand side. The bottom die 51, the central top die 55, and the left-hand side and the right-hand side divided top dies 57 include a shaping surface 51a, a shaping surface 55a and a shaping surface 57a, respectively, which form the cavity of the preliminary shaped item 40 which is to be shaped with the die closed. The shaping surface 51a, the shaping surface 55a and the shaping surface 57a respectively of the bottom die 51, the central top die 55, and the left-hand side and the right-hand side divided top dies 57, like the shaping surfaces 21a and 25a of the preliminary shaping die 20 described earlier, are formed by a highly breathable punching metal which includes a number of holes. The shaping surface 51a of the bottom die 51 forms a front surface portion of the preliminary shaped item 40. The shaping surface 55a of the central top die 55 forms a central back surface portion of the preliminary shaped item 40. The shaping surfaces 57a of the left-hand side and the right-hand side divided top dies 57 form back surface portions of the left-hand and the right-hand side portions 43 of the preliminary shaped item 40. The bottom die 51 includes an air supply slot 52 in the bottom surface thereof. Meanwhile, an exhaust slot 56 and an exhaust slot 58 are formed in the top surfaces of the central top die 55 and the left-hand side and the right-hand side divided top dies 57, respectively.

[0056] To shape the preliminary shaped item 40 using the preliminary shaping die 50 described above, in Fig. 12(a), the fibrillated fiber material 100 is filled into an inner space between the respective top dies 55, 57 and the bottom die 51 which are opened, by air feeding with a pressure feed force or a suction force, in a similar manner to the first preferred embodiment. At this stage, the left-hand side and the right-hand side divided top dies 57 are located at a further elevated position than the central top die 55. As in the first preferred embodiment, in this case as well, since the preliminary shaped item 40 has a simple shape which is close to a rectangular parallelepiped, filling is performed at a constant density distribution while avoiding density shortage or filling shortage which is otherwise caused during filling of the fibrillated fiber material 100 into the preliminary shaping die 50.

[0057] Next, in Fig. 12(b), the central top die 55 and the left-hand side and the right-hand side divided top dies 57 are closed over the bottom die 51 and the fiber material 100 is clamped. At this stage, since the respective shaping surfaces 55a and 57a of the central top die 55 and the left-hand side and the right-hand side divided top dies 57 are clamped so as to eventually arrive at approximately the same plane, the left-hand side and the right-hand side divided top dies 57 are clamped more than the central top die 55. Clamping of the central top die 55 is continued until the density of fibrillated fiber material 100 becomes about 0.03 g/cm^3, for example. Meanwhile, the left-hand side and the right-hand side divided top dies 57 are clamped until the density of the fibrillated fiber material 100 becomes about 0.04 to 0.05 g/cm^3, for example. Next, as in the first preferred embodiment, in the clamping condition described immediately above, heated air is fed inside the bottom die 51 under pressure through the air supply slot 52 of the bottom die 51. After being blown through the fiber material 100, the heated air is discharged outside at the respective exhaust slots 56 and 58 through the central top die 55 and the left-hand side and the right-hand side divided top dies 57. Heated by heated air, the binder fiber which is contained in the fiber material 100 half melts, whereby the matrix fiber is preliminarily shaped in the shape of the preliminary shaped item.

[0058] Next, instead of the heated air, cool air is blown through the fiber material 100 which now has the shape of the preliminary shaped item, to thereby cool the fiber material 100 to about 100°C, for example. This solidifies the half melted binder fiber. After this, the shaping die is opened and the shaped item is detached from the shaping die, whereby the preliminary shaped item 40 as that shown in Fig. 11(a) is obtained.

[0059] As in the first preferred embodiment of the present invention, the preliminary shaped item 40 is finally shaped using the final shaping die 30 into the seat back pad 1 (See Figs. 2(a) through 2(d)). During final shaping, as shown in the cross sectional view in Fig. 13, the preliminary shaped item 40 is filled as if pressed into the shaping surface 31a of the bottom die 31 of the final

shaping die 30 without having the side portions 43 of the left-hand side and the right-hand side folded against the shaping surface 31a.

[0060] Schematic views showing the shaping steps described above are shown in Figs. 10(a) through 10(f). More specifically, Figs. 10(a) through 10(c) show the preliminary shaping step, among which Fig. 10(a) shows the step of filling the fiber material 100, Fig. 10 (b) shows the step of heat-clamping and cooling of the fiber material 100, and Fig. 10(c) shows the preliminary shaped item 40 as it is after being detached from the shaping die. On the other hand, Figs. 10(d) through 10 (f) show the final shaping step, among which Fig. 10(d) shows the step of filling the preliminary shaped item 40, Fig. 10(e) shows the step of heat-clamping and cooling of the preliminary shaped item 40, and Fig. 10(f) shows the seat back pad 1 as it is after being detached from the shaping die.

[0061] A similar seat back pad 1 to that of the first preferred embodiment is obtained by the method above of shaping the similar seat back pad 1 which is formed by the fibrous elastic body described above. In addition, as the fiber material 100 is clamped with a clamping volume which is locally different during preliminary shaping, it is possible to shape the preliminary shaped item 40 which is locally made dense, and therefore, it is possible to fill the preliminary shaped item 40 into the final shaping die 30 without folding the preliminary shaped item 40 and to create a high-density portion of the seat back pad 1 in an easy manner.

[0062] The method of and the apparatus for shaping a fibrous elastic body according to the present invention are not limited to the preferred embodiments described above, but rather, modifications and variations can be devised without departing from the scope of the invention. For instance, the present invention is not limited to the seat back pad 1, but is applicable to shapes produced in general, such as a seat cushion pad, which are formed by other fibrous elastic bodies. Further, instead of a polyester fiber, the fiber material may be other chemical fiber such as a polyamide fiber, an acrylic fiber, a polypropylene fiber and so on.

[0063] With the method of and the apparatus for shaping a fibrous elastic body according to the present invention, it is possible to shape an objective article with excellent productivity while avoiding a defective shape due to density shortage, filling shortage, etc.

Claims

1. A method of shaping a fibrous elastic body, by shaping a fiber material into a predetermined objective article;

    said fiber material containing a binder fiber that melts when heated;

    characterized in that:

    said fiber material is filled in a preliminary shaping die to shape a preliminary shaped item which has a preliminary shape of said objective article; and
    said preliminary shaped item is filled into a final shaping die with said preliminary shaped item partially folded to make said objective article locally dense, heated up and clamped, whereby said preliminary shaped item is shaped into said objective article.

2. The method of shaping a fibrous elastic body in Claim 1, wherein said fiber material is fibrillated.

3. The method of shaping a fibrous elastic body in Claim 1 or 2, wherein during shaping of said preliminary shaped item, said binder fiber is half melted to shape said preliminary shaped item.

4. The method of shaping a fibrous elastic body in any one of Claims 1 through 3, wherein said preliminary shape of said preliminary shaped item is a developed shape of said objective article.

5. The method of shaping a fibrous elastic body of any one of Claims 1 through 4, wherein said fiber material is clamped with a clamping volume which is locally different, during preliminary shaping.

6. The method of shaping a fibrous elastic body in any one of Claims 1 through 5, wherein said fiber material is partially shaped into a final objective shape and otherwise shaped into said preliminary shape during preliminary shaping;

    a portion which is shaped into said preliminary shape being shaped into said final objective shape during final shaping.

7. The method of shaping a fibrous elastic body in any one of Claims 1 through 6, wherein parts, such as a backing strip, a front layer pad, an insert wire and so on, are also filled when said preliminary shaped item is filled in said final shaping die;

    said parts and said preliminary shaped item being shaped as integrated with each other during final shaping.

8. The method of shaping a fibrous elastic body in Claim 7, said preliminary shaped item and said parts being filled in said final shaping die, with bonding means inserted between said preliminary shaped item and said parts.

9. An apparatus for shaping a fibrous elastic body, by shaping a fiber material into a predetermined objec-

tive article;

said fiber material containing a binder fiber which melts when heated;

characterized by:

a preliminary shaping die into which said fiber material is filled to shape a preliminary shaped item which has a preliminary shape of said objective article; and
a final shaping die in which said preliminary shaped item is filled, heated and clamped so that said preliminary shaped item is shaped into said objective article,

wherein said final shaping die has a structure for filling said preliminary shaped item as it is partially folded, so that said objective article is made locally dense

10. The apparatus for shaping a fibrous elastic body in Claim 9, wherein a fibrillated fiber material is filled into said preliminary shaping die.

11. The apparatus for shaping a fibrous elastic body in Claim 9 or 10, wherein said preliminary shaping die has a structure for half melting said binder fiber and for shaping said preliminary shaped item.

12. The apparatus for shaping a fibrous elastic body in any one of Claims 9 through 11. wherein said preliminary shaping die has a structure for shaping said preliminary shaped item which has a developed shape of said objective article.

13. The apparatus for shaping a fibrous elastic body in any one of Claims 9 through 12, wherein said preliminary shaping die has a structure for clamping said fiber material with a locally different clamping volume.

14. The apparatus for shaping a fibrous elastic body in any one of Claims 9 through 13, wherein said preliminary shaping die has a structure for shaping said preliminary shaped item partially into a final objective shape and otherwise into said preliminary shape, and said final shaping die has a structure for shaping a portion of said preliminary shaped item which has said preliminary shape into said final objective shape.

15. The apparatus for shaping a fibrous elastic body in any one of Claims 9 through 14, wherein said final shaping die has a structure for filling parts, such as a backing strip, a front layer pad, an insert wire and so on, together with said preliminary shaped item and said final shaping die has a structure for shaping said parts and said preliminary shaped item simultaneously so that said parts and said preliminary shaped item are integrated with each other.

16. The apparatus for shaping a fibrous elastic body in Claim 15, wherein said final shaping die has a structure for filling said preliminary shaped item and said parts, with an adhesive agent disposed between said preliminary shaped item and said parts.

Patentansprüche

1. Verfahren zum Formen eines faserigen, elastischen Körpers durch Formen eines Fasermaterials zu einem vorgegebenen Zielartikel,
wobei das Fasermaterial eine Bindemittelfaser aufweist, die schmilzt, wenn sie erwärmt wird,
dadurch gekennzeichnet, daß
das Fasermaterial in einen Vorformungs-Prägekörper gefüllt wird, um einen vorgeformten Gegenstand zu formen, der eine vorläufige Form des Zielartikels aufweist, und
der vorgeformte Gegenstand in einen Endformungs-Prägekörper gefüllt wird, wobei der vorgeformte Gegenstand teilweise gefaltet wird, um den Zielartikel lokal dicht zu machen, erwärmt und geklemmt wird, wodurch der vorgeformte Gegenstand zu dem Zielartikel geformt wird.

2. Verfahren zum Formen eines faserigen, elastischen Körpers nach Anspruch 1, wobei das Fasermaterial fibrilliert ist.

3. Verfahren zum Formen eines faserigen, elastischen Körpers nach Anspruch 1 oder 2, wobei während des Formens des vorgeformten Gegenstands die Bindemittelfaser halb geschmolzen wird, um den vorgeformten Gegenstand zu formen.

4. Verfahren zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 1 bis 3, wobei die vorläufige Form des vorgeformten Gegenstands eine entwickelte Form des Zielartikels ist.

5. Verfahren zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 1 bis 4, wobei das Fasermaterial während des Vorformens mit einem Klemmvolumen geklemmt wird, das lokal unterschiedlich ist.

6. Verfahren zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 1 bis 5, wobei das Fasermaterial während des Vorformens teilweise zu einer endgültigen Zielform und ansonsten zu der vorläufigen Form geformt wird,
wobei ein Teil, der zu der vorläufigen Form ge-

formt wird, während des endgültigen Formens zu der endgültigen Zielform geformt wird.

7. Verfahren zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 1 bis 6, wobei Teile, wie ein Backing- bzw. Unterlegstreifen, ein Vorderschichtpolster, ein eingefügter Draht usw. auch eingefüllt werden, wenn der vorgeformte Gegenstand in den Endformungs-Prägekörper eingefüllt wird,

   wobei die Teile und der vorgeformte Gegenstand während des endgültigen Formens miteinander integriert geformt werden.

8. Verfahren zum Formen eines faserigen, elastischen Körpers nach Anspruch 7, wobei der vorgeformte Gegenstand und die Teile in den Endformungs-Prägekörper gefüllt werden,
wobei ein Bindemittel zwischen den vorgeformten Gegenstand und die Teile eingeführt wird.

9. Vorrichtung zum Formen eines faserigen, elastischen Körpers durch Formen eines Fasermaterials zu einem vorgegebenen Zielartikel,

   wobei das Fasermaterial eine Bindemittelfaser aufweist, die schmilzt, wenn sie erwärmt wird,
   gekennzeichnet durch:

   einen Vorformungs-Prägekörper, in den das Fasermaterial eingefüllt wird, um einen vorgeformten Gegenstand zu formen, der eine vorläufige Form des Zielartikels aufweist, und
   einen Endformungs-Prägekörper, in den der vorgeformte Gegenstand gefüllt und in dem er erwärmt und geklemmt wird, so daß der vorgeformte Gegenstand zu dem Zielartikel geformt wird,

   wobei der Endformungs-Prägekörper eine Struktur zum Füllen des vorgeformten Gegenstands aufweist, wenn er teilweise gefaltet ist, so daß der Zielartikel lokal dicht gemacht wird.

10. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach Anspruch 9, wobei ein fibrilliertes Fasermaterial in den Vorformungs-Prägekörper gefüllt wird.

11. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach Anspruch 9 oder 10, wobei der Vorformungs-Prägekörper eine Struktur zum zur Hälfte erfolgenden Schmelzen der Bindemittelfaser und zum Formen des vorgeformten Gegenstands aufweist.

12. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 9 bis 11, wobei der Vorformungs-Prägekörper eine Struktur zum Formen des vorgeformten Gegenstands aufweist, der eine entwickelte Form des Zielartikels aufweist.

13. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 9 bis 12, wobei der Vorformungs-Prägekörper eine Struktur zum Klemmen des Fasermaterials mit einem lokal unterschiedlichen Klemmvolumen aufweist.

14. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 9 bis 13, wobei der Vorformungs-Prägekörper eine Struktur zum Formen des vorläufig geformten Gegenstands teilweise zu einer endgültigen Zielform und ansonsten zu der vorläufigen Form aufweist, und wobei der Endformungs-Prägekörper eine Struktur zum Formen eines Teils des vorgeformten Gegenstands, der die vorläufige Form aufweist, zu der endgültigen Zielform aufweist.

15. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach einem der Ansprüche 9 bis 14, wobei der Endformungs-Prägekörper eine Struktur zum Einfüllen von Teilen, wie eines Backing- bzw. Unterlegstreifens, eines Vorderschichtpolsters, eines eingefügten Drahts usw. zusammen mit dem vorgeformten Gegenstand aufweist, und wobei der Endformungs-Prägekörper eine Struktur zum gleichzeitigen Formen der Teile und des vorgeformten Gegenstands aufweist, so daß die Teile und der vorgeformte Gegenstand miteinander integriert werden.

16. Vorrichtung zum Formen eines faserigen, elastischen Körpers nach Anspruch 15, wobei der Endformungs-Prägekörper eine Struktur zum Füllen des vorgeformten Gegenstands und der Teile aufweist, wobei ein Klebstoff zwischen dem vorgeformten Gegenstand und den Teilen angeordnet wird.

Revendications

1. Procédé permettant de former un corps élastique fibreux, en donnant à un matériau de fibre la forme d'un article prédéterminé souhaité ;

   ledit matériau de fibre contenant une fibre de liage qui fond lorsqu'elle est chauffée ;

   caractérisé en ce que :

   on remplit une matrice de formage préliminaire avec ledit matériau de fibre afin de former un article formé préliminaire qui a une forme préliminaire dudit article souhaité ; et
   on remplit une matrice de forme finale, avec le-

dit article formé préliminaire, ledit article formé préliminaire étant partiellement plié afin de rendre ledit article souhaité localement dense, on chauffe et on presse ledit article formé préliminaire, grâce à quoi on forme ledit article formé préliminaire pour obtenir dans ledit article souhaité.

2. Procédé permettant de former un corps élastique fibreux selon la revendication 1, dans lequel ledit matériau de fibre est fibrillé.

3. Procédé permettant de former un corps élastique fibreux selon l'une quelconque des revendications 1 ou 2, dans lequel au cours du formage dudit article formé préliminaire, ladite fibre de liage est à moitié fondue afin de former ledit article formé préliminaire.

4. Procédé permettant de former un corps élastique fibreux selon l'une quelconque des revendications 1 à 3, dans lequel ladite forme préliminaire dudit article formé préliminaire est une forme développée dudit article souhaité.

5. Procédé permettant de former un corps élastique fibreux selon l'une quelconque des revendications 1 à 4, dans lequel ledit matériau de fibre est pressé avec un volume de pressage qui est localement différent, au cours du formage préliminaire.

6. Procédé permettant de former un corps élastique fibreux selon l'une quelconque des revendications 1 à 5, dans lequel ledit matériau de fibre est partiellement formé dans une forme objective finale et formé autrement dans ladite forme préliminaire au cours du formage préliminaire ;

   une partie qui est formée dans ladite forme préliminaire étant formée dans ladite forme objective finale au cours du formage final.

7. Procédé permettant de former un corps élastique fibreux selon l'une quelconque des revendications 1 à 6, dans lequel des parties, telles qu'une bande de renfort, une garniture de couche avant, un fil d'insert et ainsi de suite, sont également introduits quand on remplit ladite matrice de formage final avec ledit article formé préliminaire;

   lesdites parties et ledit article formé préliminaire étant formés intégrés l'un avec l'autre au cours du formage final.

8. Procédé permettant de former un corps élastique fibreux selon la revendication 7, ledit article formé préliminaire et lesdites parties étant introduits dans ladite matrice de formage final, des moyens de liaison étant insérés entre ledit article formé préliminaire et lesdites parties.

9. Dispositif permettant de former un corps élastique fibreux, en formant un matériau de fibre dans un article prédéterminé souhaité ;

   ledit matériau de fibre contenant une fibre de liage qui fond lorsqu'elle est chauffée ;

   caractérisé par :

   une matrice de formage préliminaire dans laquelle on introduit ledit matériau de fibre afin de former un article formé préliminaire qui a une forme préliminaire dudit article souhaité ; et une matrice de formage final dans laquelle on introduit ledit article formé préliminaire, on chauffe et on presse, de sorte à former ledit article formé préliminaire pour obtenir ledit article souhaité, dans lequel ladite matrice de formage final possède une structure qui permet d'introduire ledit article formé préliminaire pendant qu'il est partiellement plié, de sorte que ledit article souhaité est rendu localement dense.

10. Dispositif permettant de former un corps élastique fibreux selon la revendication 9, dans lequel on introduit un matériau de fibre fibrillé dans ladite matrice de formage préliminaire.

11. Dispositif permettant de former un corps élastique fibreux selon l'une quelconque des revendications 9 ou 10, dans lequel ladite matrice de formage préliminaire possède une structure qui permet de fondre à moitié ladite fibre de liage et de former ledit article formé préliminaire.

12. Dispositif permettant de former un corps élastique fibreux selon l'une quelconque des revendications 9 à 11, dans lequel ladite matrice de formage préliminaire possède une structure qui permet de former ledit article formé préliminaire qui a une forme développée dudit article souhaité.

13. Dispositif permettant de former un corps élastique fibreux selon l'une quelconque des revendications 9 à 12, dans lequel ladite matrice de formage préliminaire possède une structure qui permet de presser ledit matériau de fibre avec un volume de pressage localement différent.

14. Dispositif permettant de former un corps élastique fibreux selon l'une quelconque des revendications 9 à 13, dans lequel ladite matrice de formage préliminaire possède une structure qui permet de former ledit article formé préliminaire partiellement dans une forme finale souhaitée et autrement dans

ladite forme préliminaire, et ladite matrice de formage final possède une structure qui permet de former une partie dudit article formé préliminaire qui possède ladite forme préliminaire pour obtenir ladite forme souhaitée finale.

15. Dispositif permettant de former un corps élastique fibreux selon l'une quelconque des revendications 9 à 14, dans lequel ladite matrice de formage final possède une structure qui permet d'introduire des parties, telles qu'une bande de renfort, une garniture de couche avant, un fil d'insert et ainsi de suite, ainsi que ledit article formé préliminaire, et dans lequel ladite matrice de formage final possède une structure qui permet de former lesdites parties et ledit article formé préliminaire simultanément de sorte que lesdites parties et ledit article formé préliminaire sont intégrés l'un avec l'autre.

16. Dispositif permettant de former un corps élastique fibreux selon la revendication 15, dans lequel ladite matrice de formage final possède une structure qui permet de le remplir avec ledit article formé préliminaire et lesdites parties, avec un agent adhésif disposé entre ledit article formé préliminaire et lesdites parties.

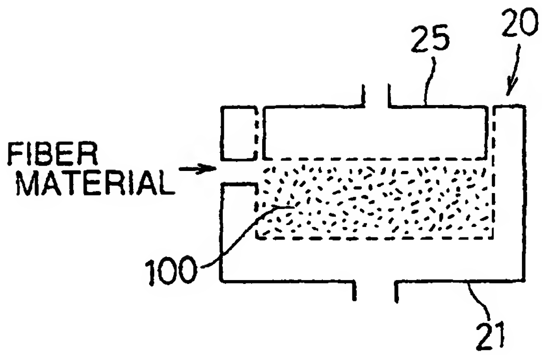


FIG.1 (a)

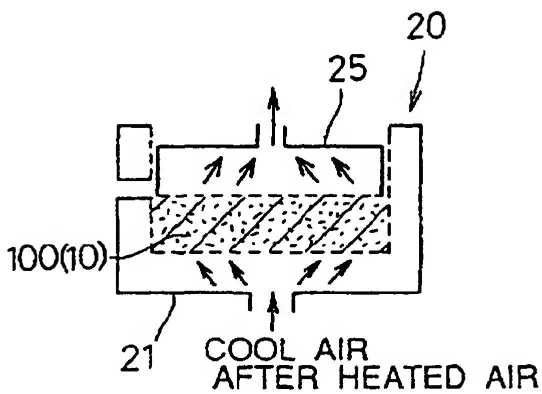


FIG.1 (b)

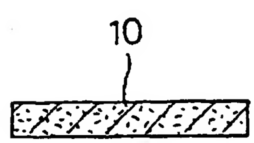


FIG.1 (c)

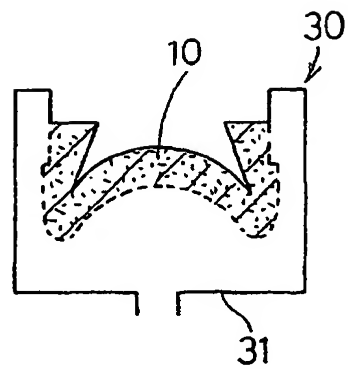


FIG.1 (d)

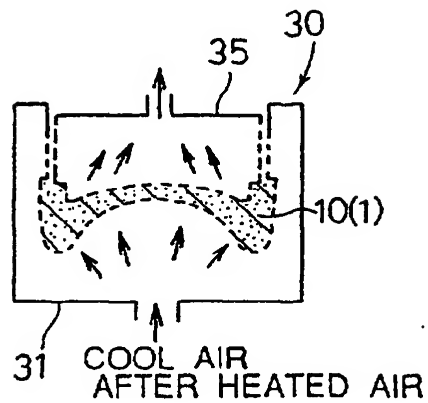


FIG.1 (e)

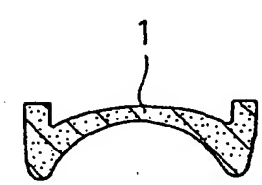


FIG.1 (f)

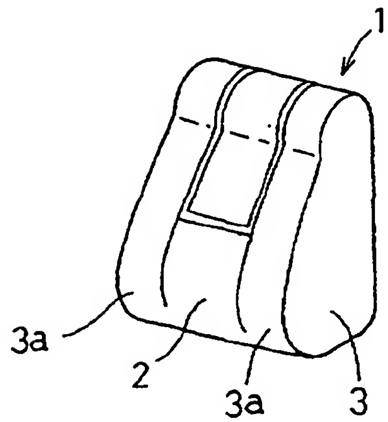


FIG.2 (a)

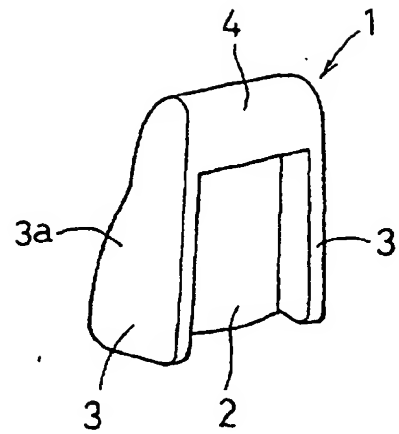


FIG.2 (b)

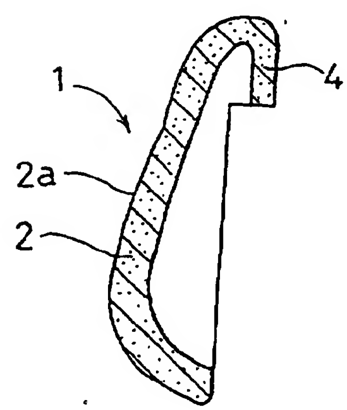


FIG.2 (c)

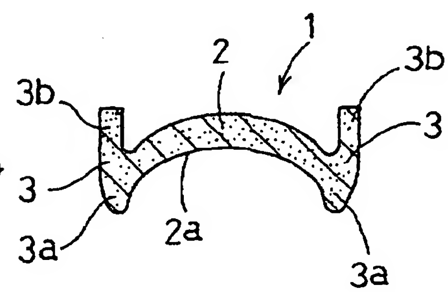


FIG.2 (d)

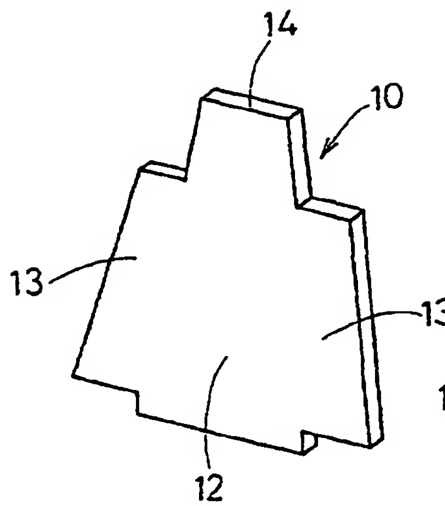


FIG.3 (a)

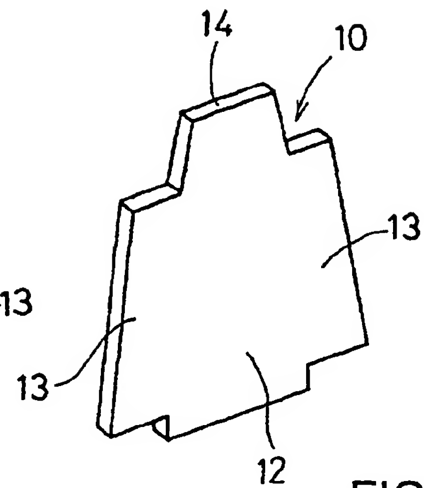
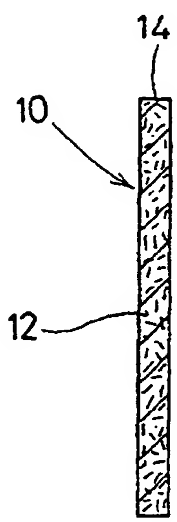


FIG.3 (b)



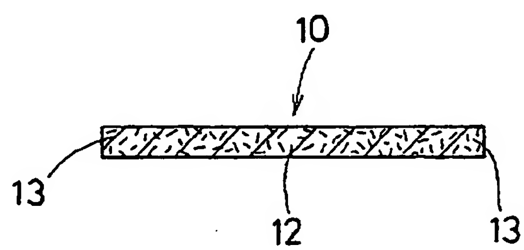


FIG.3 (d)

FIG.3 (c)

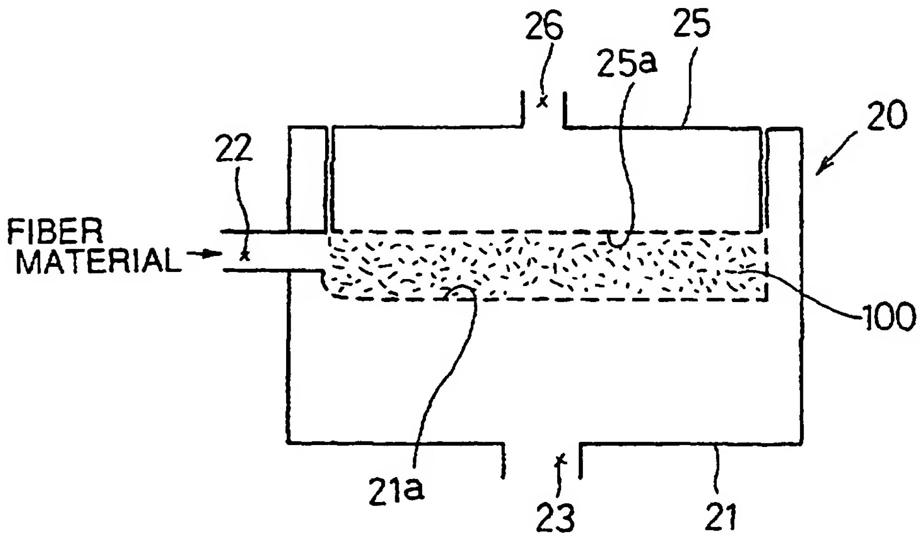

26
25
25a
20
22
FIBER MATERIAL
100
21a
23
21

FIG.4 (a)

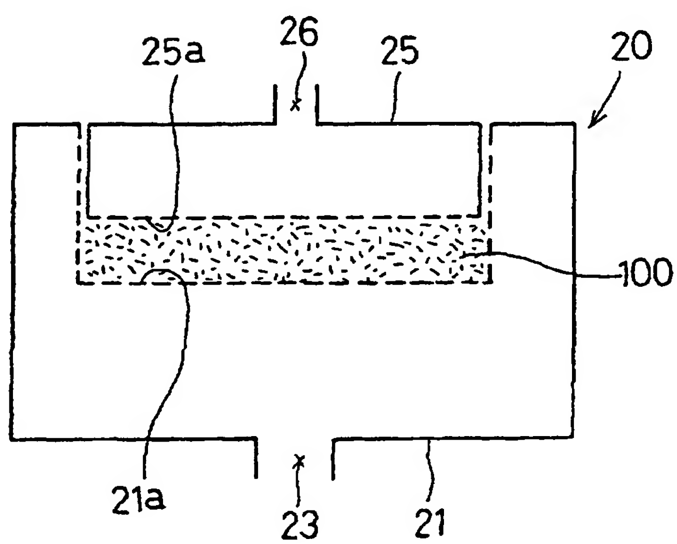

26
25a
25
20
100
21a
23
21

FIG.4 (b)

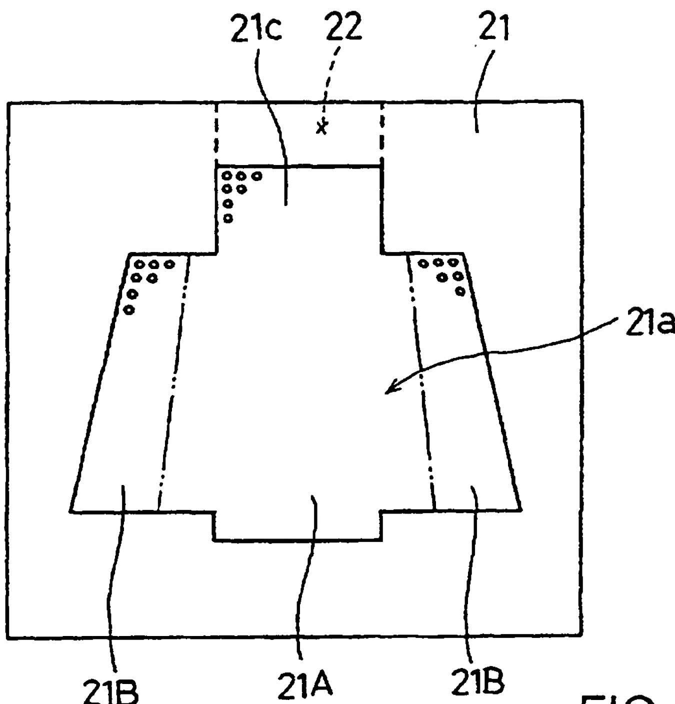


FIG.5

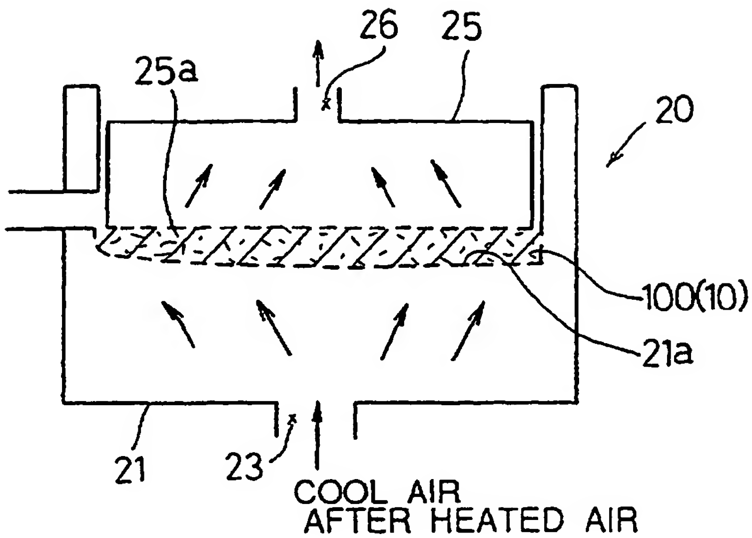

26
25
25a
20
100(10)
21a
21
23
COOL AIR
AFTER HEATED AIR

FIG.6 (a)

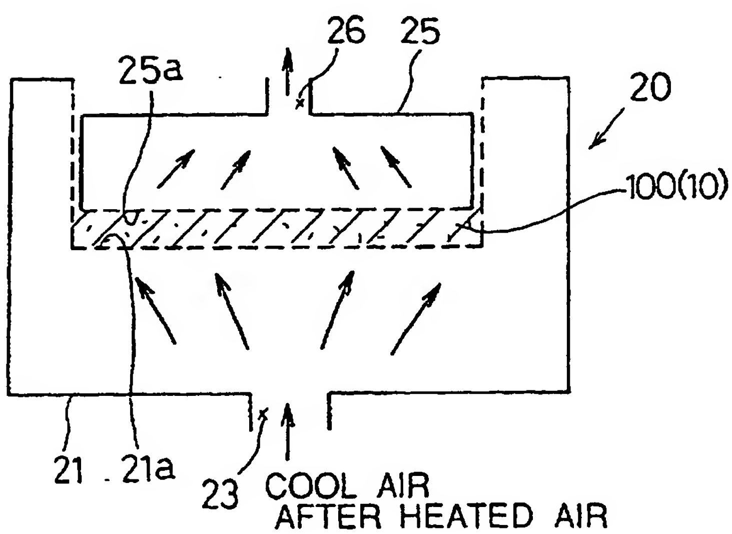

26
25
25a
20
100(10)
21
21a
23
COOL AIR
AFTER HEATED AIR

FIG.6 (b)

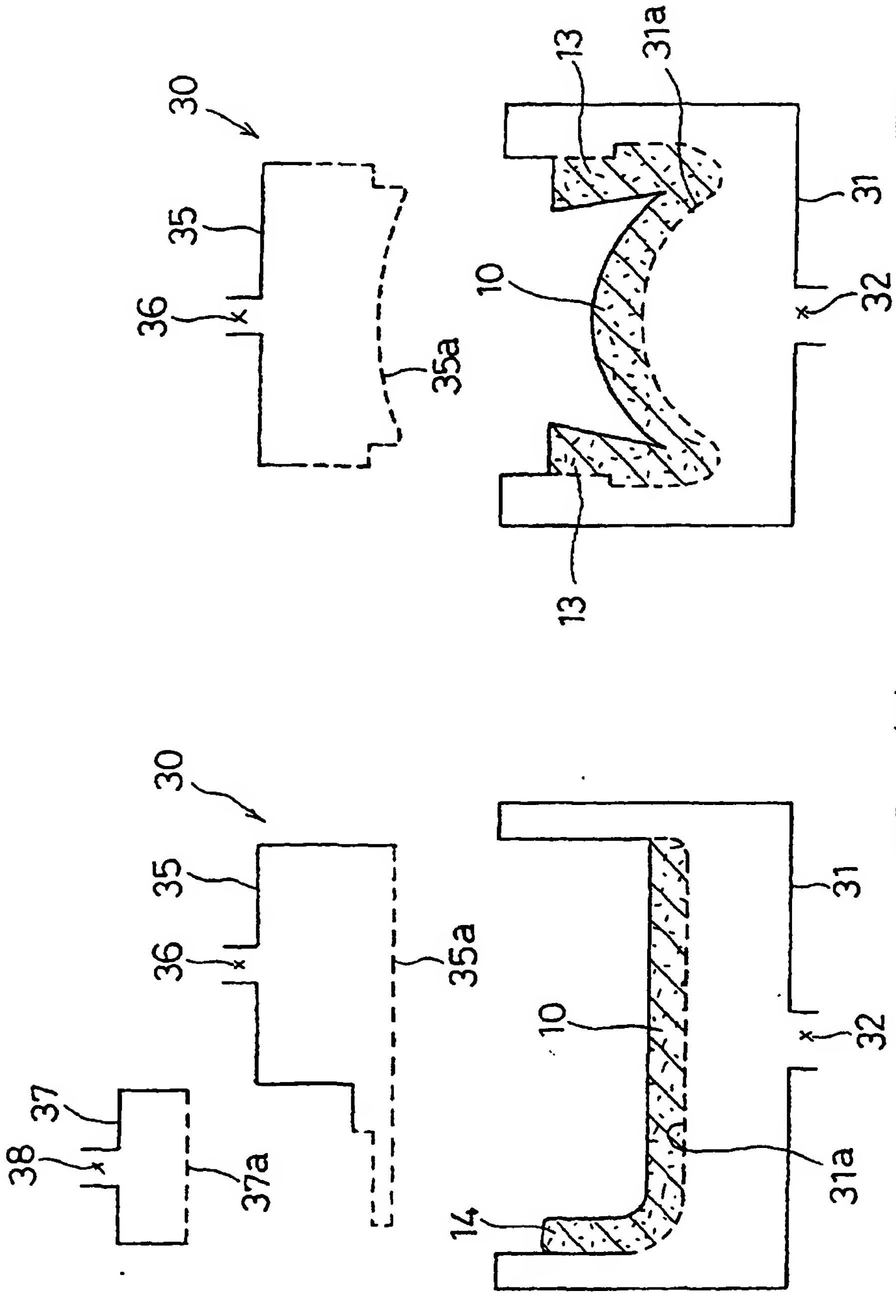


FIG.7 (b)

FIG.7 (a)

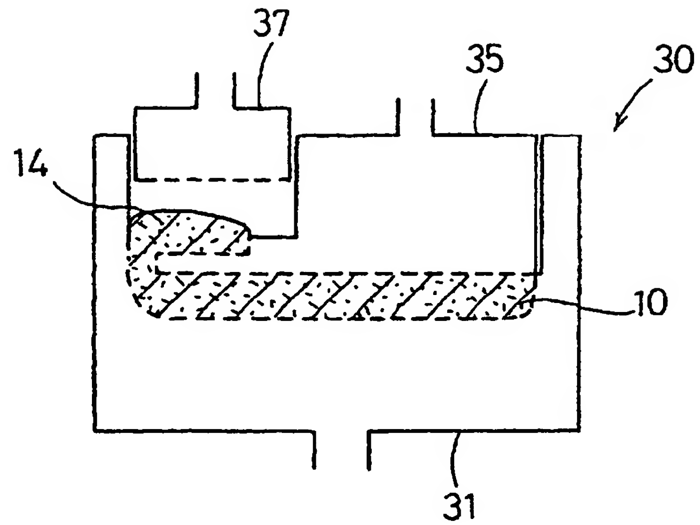


FIG.8 (a)

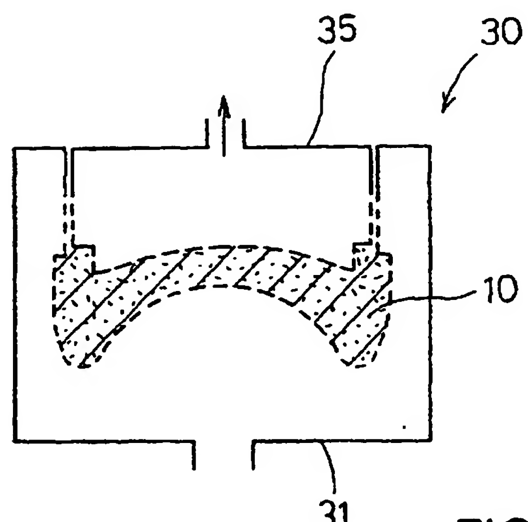


FIG.8 (b)

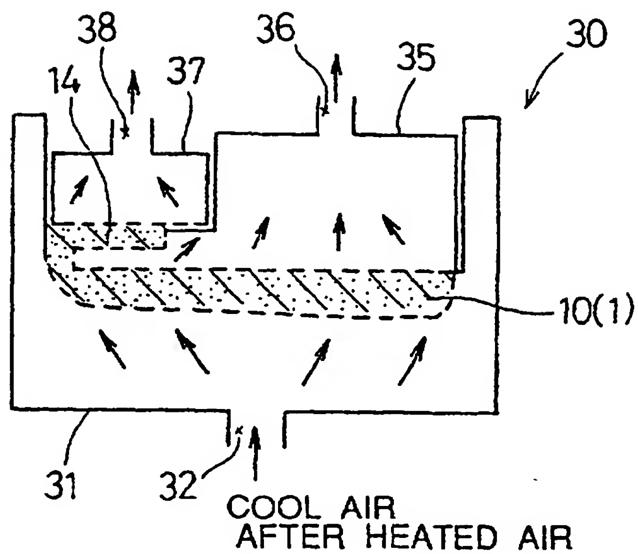

38
36
30
14
37
35
10(1)
31
32
COOL AIR
AFTER HEATED AIR

FIG.9 (a)

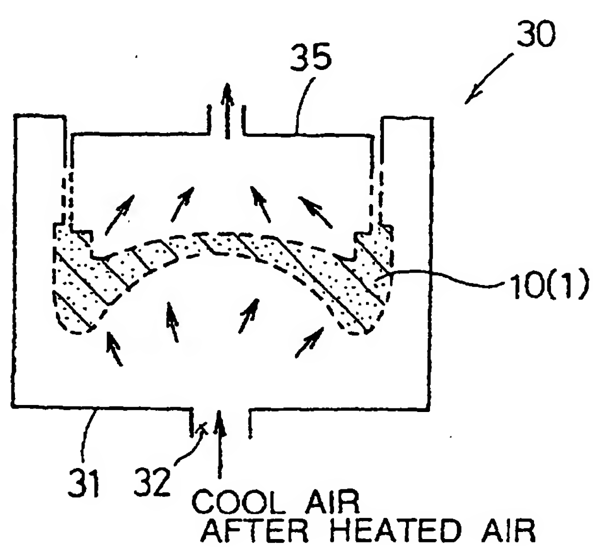

30
35
10(1)
31
32
COOL AIR
AFTER HEATED AIR

FIG.9 (b)

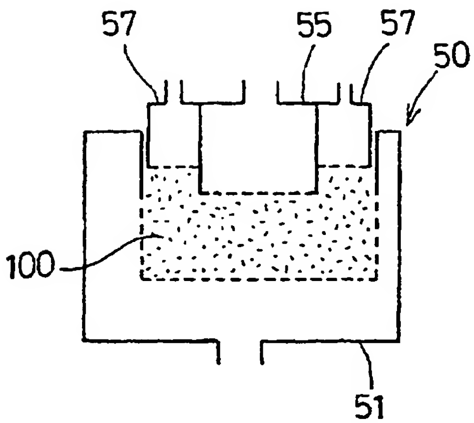


FIG.10 (a)

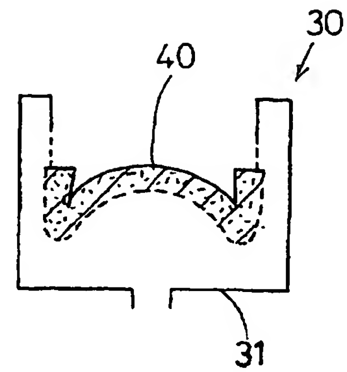


FIG.10 (d)

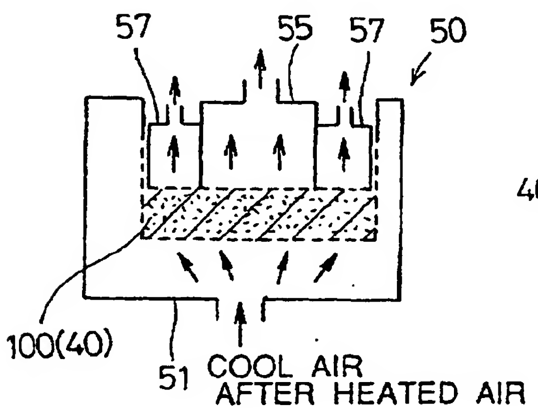


FIG.10 (b)

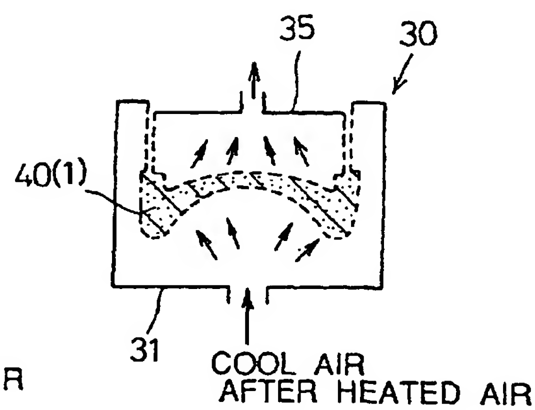


FIG.10 (e)

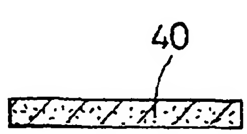


FIG.10 (c)

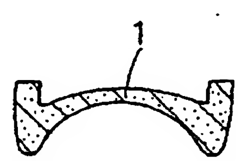


FIG.10 (f)

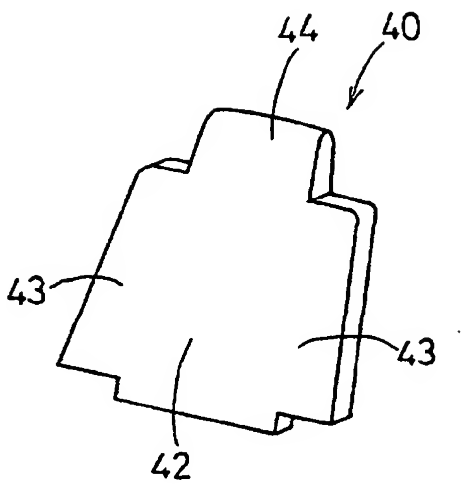


FIG.11 (a)

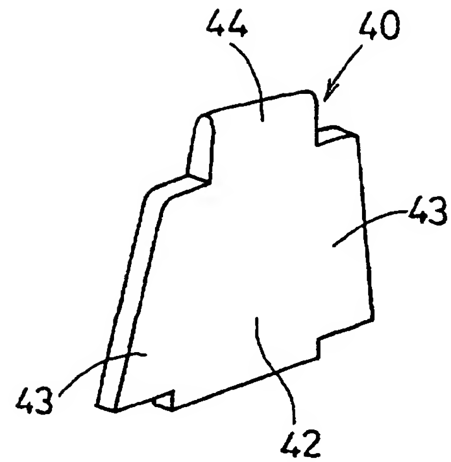


FIG.11 (b)

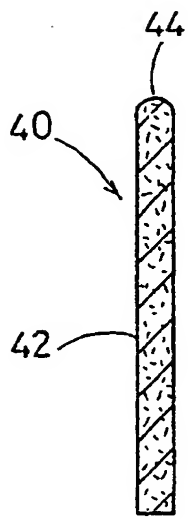


FIG.11 (c)

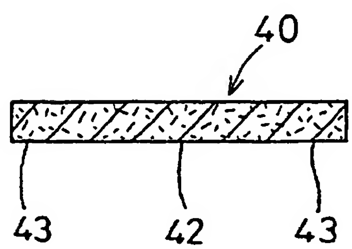


FIG.11 (d)

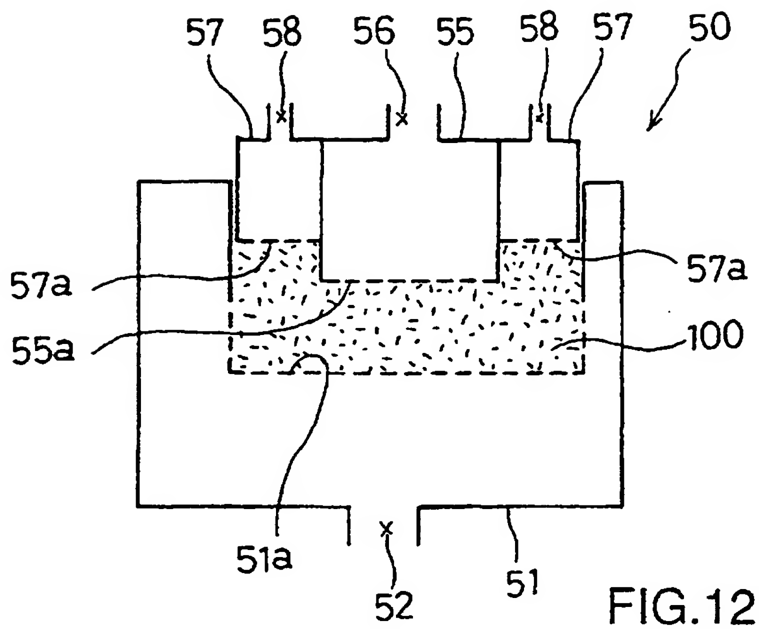


FIG.12 (a)

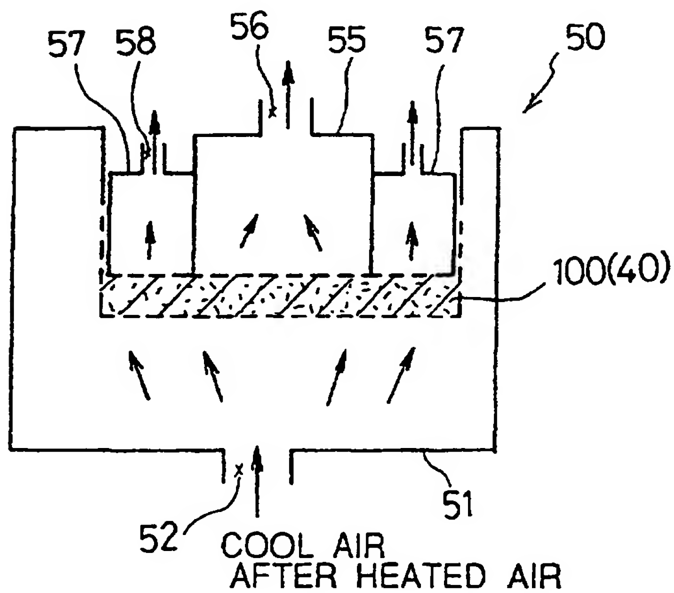


FIG.12 (b)

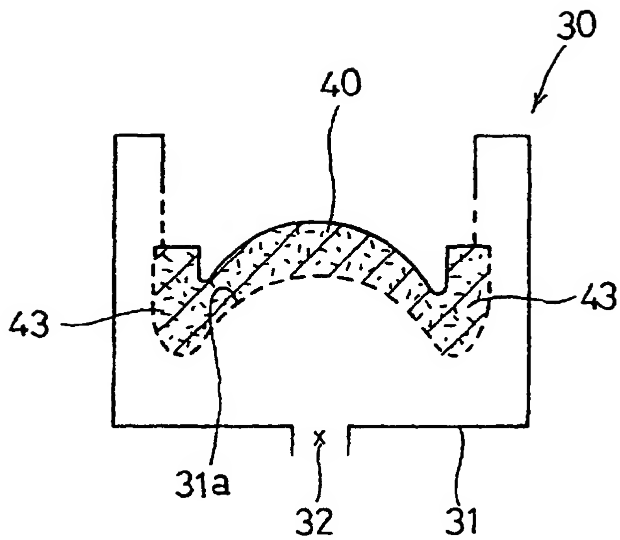


FIG.13

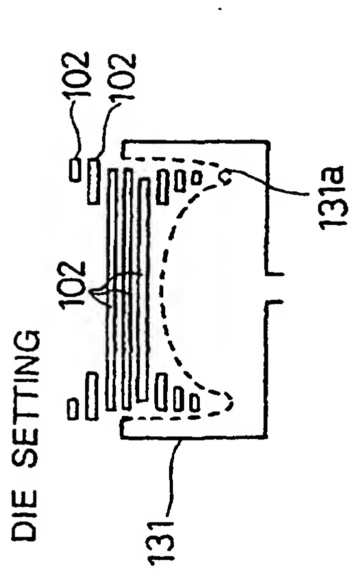


FIG.14 (a)

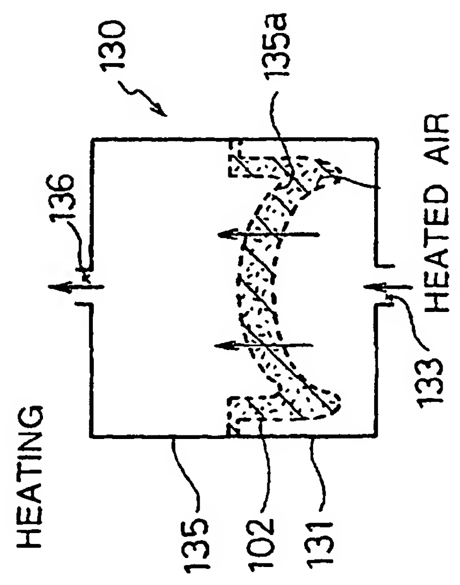


FIG.14 (b)

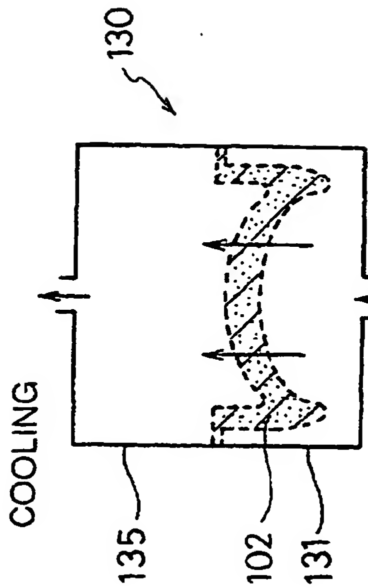


FIG.14 (c)

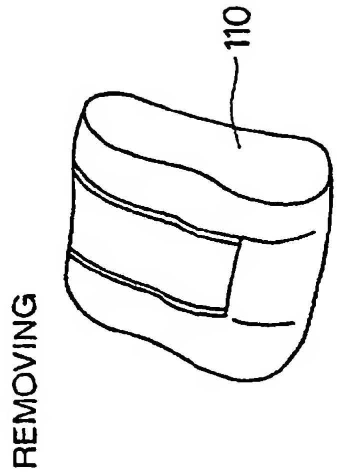


FIG.14 (d)

RAW MATERIAL

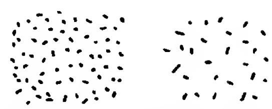


FIG.15 (a)

COTTON BLENDING

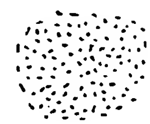


FIG.15 (b)

FIBRILLATION

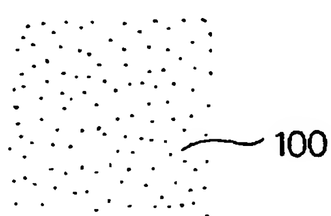


FIG.15 (c)

MATTING

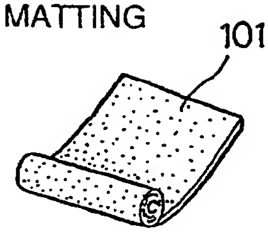


FIG.15 (d)

CUTTING

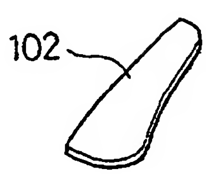


FIG.15 (e)

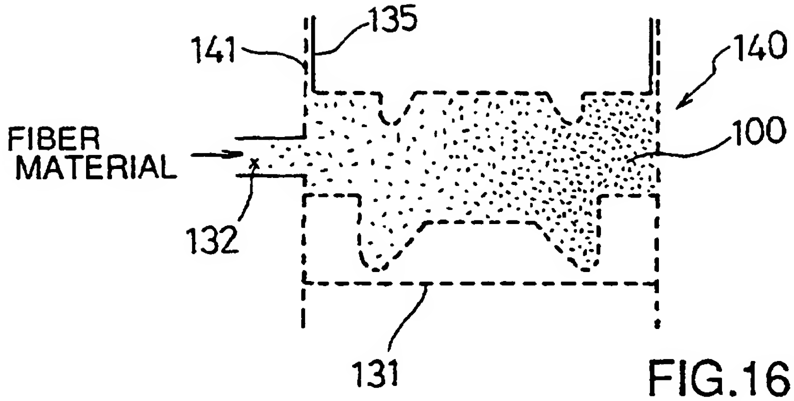


FIG.16

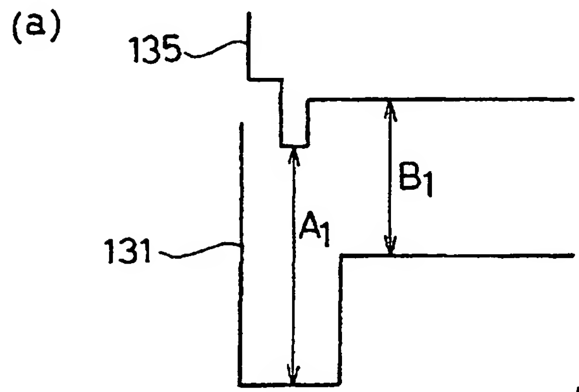


FIG.17 (a)

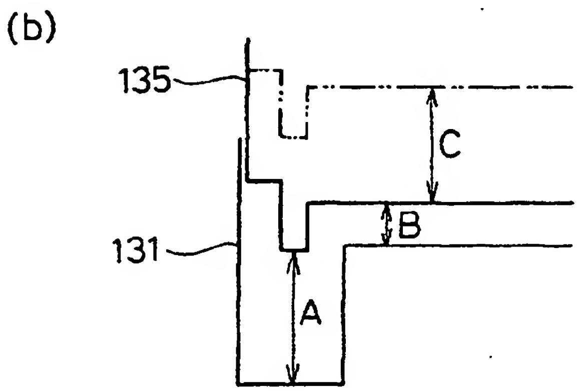


FIG.17 (b)

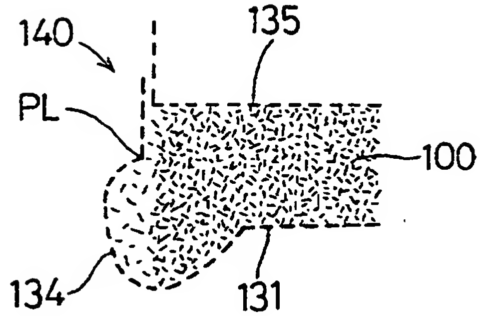


FIG.18 (a)

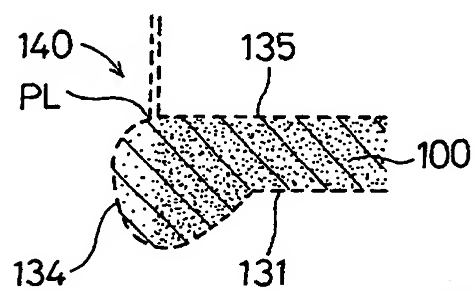


FIG.18 (b)

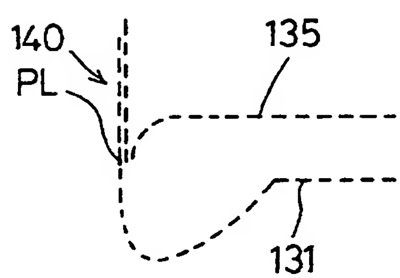


FIG.18 (c)

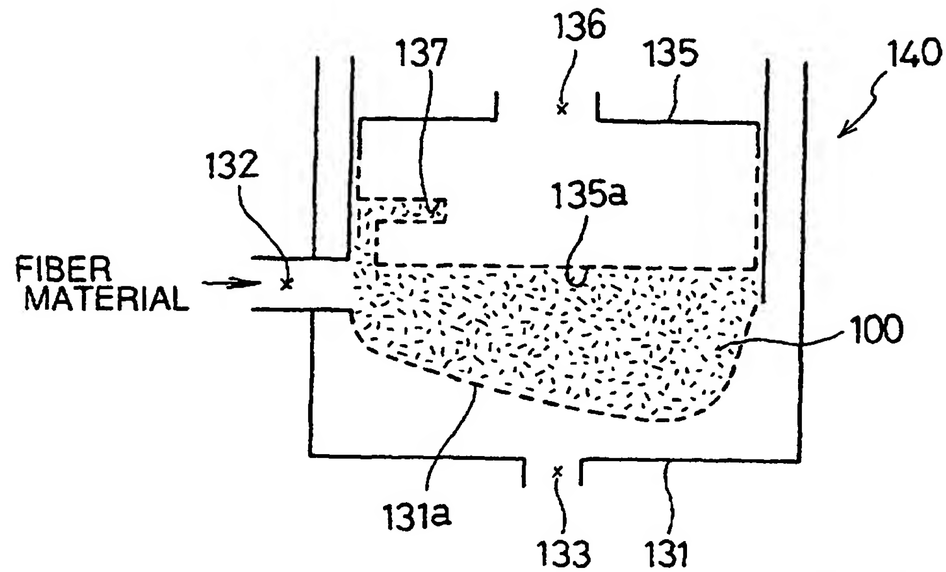


FIG.19 (a)

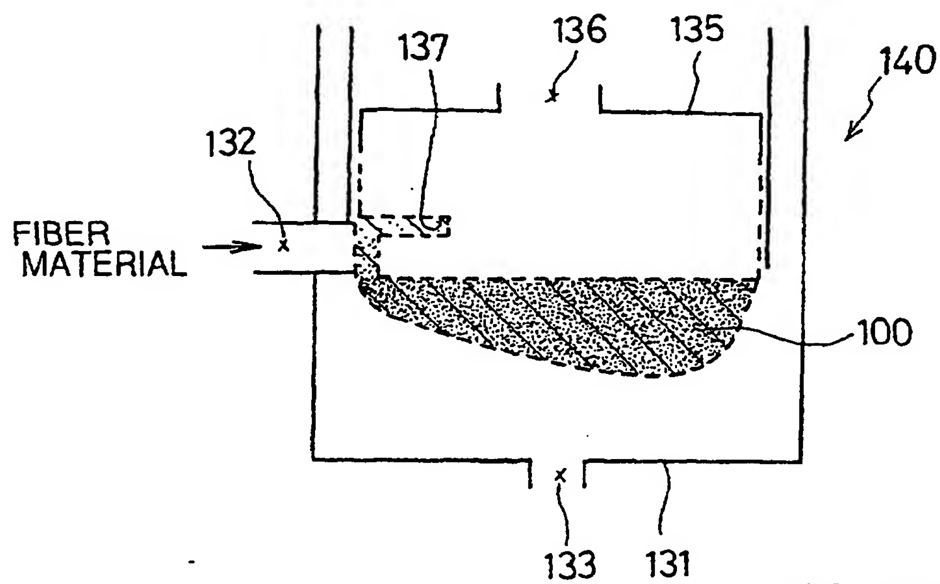


FIG.19 (b)

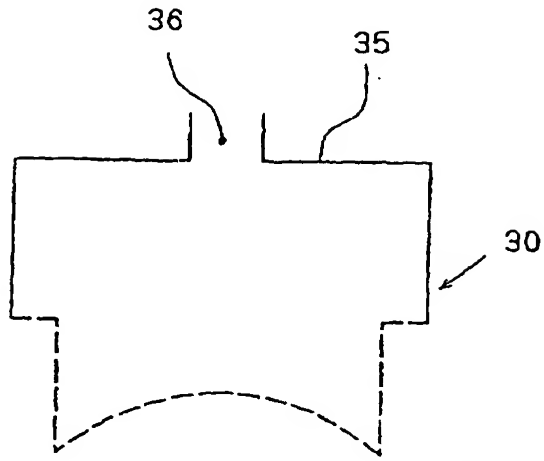


FIG.20 (a)

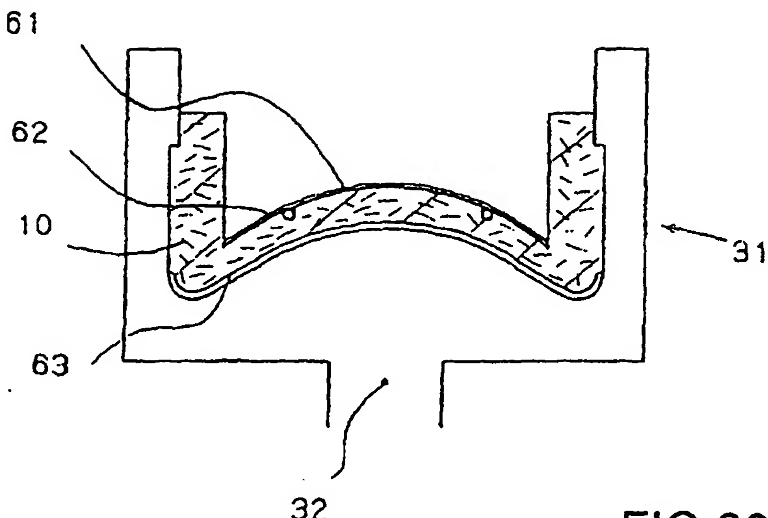


FIG.20 (b)

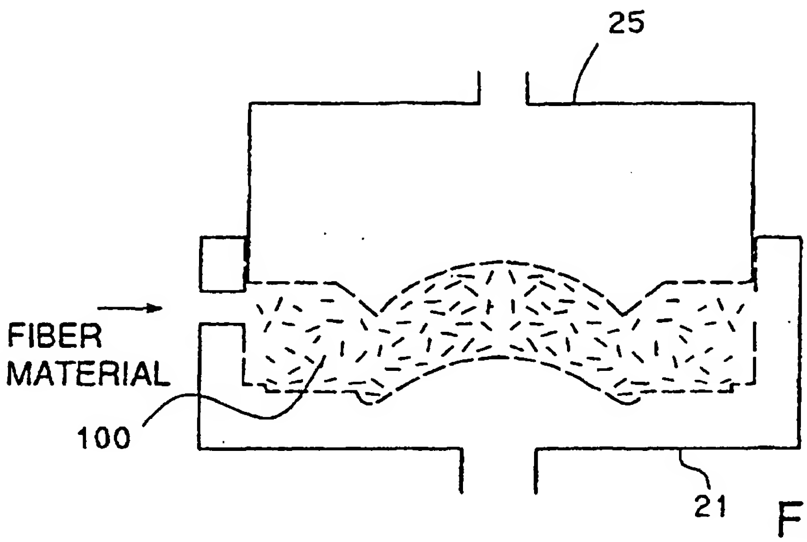


FIG.21 (a)

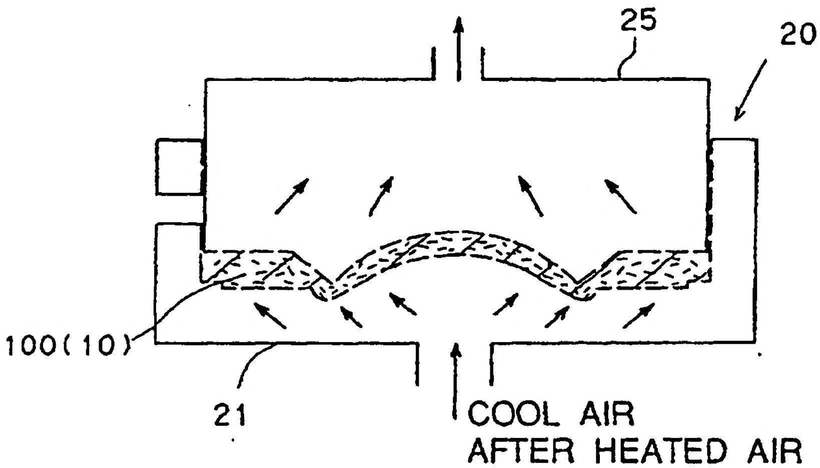


FIG.21 (b)

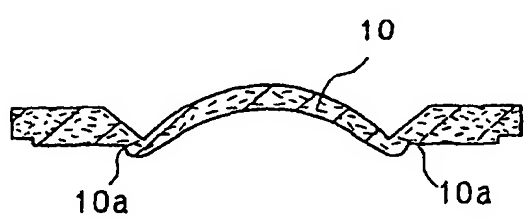


FIG.21 (c)